

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE	PAGE OF PAGES
2. AMENDMENT/MODIFICATION NO. 0003		3. EFFECTIVE DATE 1 August 2005		4. REQUISITION/PURCHASE REQ. NO.	
5. PROJECT NO. (If applicable)		6. ISSUED BY		7. ADMINISTERED BY (If other than Item 6)	
US ARMY ENGINEER DISTRICT, PHILADELPHIA CONTRACTING DIVISION WANAMAKER BUILDING 100 PENN SQUARE EAST PHILADELPHIA, PA 19107-3390		US ARMY ENGINEER DISTRICT, PHILADELPHIA POC: JOSEPH BUJNOWSKI WANAMAKER BUILDING 100 PENN SQUARE EAST PHILADELPHIA, PA 19107-3390			
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				<input checked="" type="checkbox"/> 9A. AMENDMENT OF SOLICITATION NO. W912BU-05-R-0025 <input checked="" type="checkbox"/> 9B. DATED (SEE ITEM 11) 17 JUNE 2005 10A. MODIFICATION OF CONTRACTS/ORDER NO. 10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE			

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☒ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

BUILDING 20 SHIP SYSTEM SUPPORT FACILITY, NEW TESTING LAB RETROFIT, PHILA. NAVAL SHIPYARD, PHILA.,

**13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

(✓)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

THIS AMENDMENT PROVIDES FOR ALL CHANGES MADE DURING NEGOTIATIONS.

(CONTINUED)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY _____ (Signature of Contracting Officer)	

14. DESCRIPTION OF AMENDMENT (continued)

a. **SECTION 00800 - SPECIAL CONTRACT REQUIREMENTS:**

(1) SECTION 00800 - SPECIAL CLAUSES - Please delete page 00800-2 in its entirety and substitute revised section 00800-2, annotated Amendment No. 0003, attached hereto.

b. **TECHNICAL SPECIFICATIONS:**

(1) Project Table of Contents: Please delete project table of contents pages 1 and 2 in their entirety and substitute revised pages 1 and 2 annotated Amendment No. 0003, attached hereto.

(2) Section 01330 - SUBMITTAL PROCEDURES: Please delete pages 01330-10 through 01330-27 in their entirety and substitute revised pages 01330-10 through 01330-26 annotated Amendment No. 0003, attached hereto.

(3) Section 01451 - CONTRACTOR QUALITY CONTROL: Please delete page 01451-4 in its entirety and substitute revised page 01451-4 annotated Amendment No. 0003, attached hereto.

(4) Section 01500 - TEMPORARY CONSTRUCTION: Please delete pages 01500-1 and 2 in their entirety and substitute revised pages 01500-1 and 2 annotated Amendment No. 0003, attached hereto.

(5) Section 05400 - COLD-FORMED METAL FRAMING: Please delete this section in its entirety.

(6) Section 06410 - LAMINATE CLAD ARCHITECTURAL CASEWORK: Please delete pages 06410-1 through 06410-10 in their entirety and substitute revised pages 06410-1 through 06410-8 annotated Amendment No. 0003, attached hereto.

(7) Section 08110 - STEEL DOORS AND FRAMES: Please delete page 08110-3 in its entirety and substitute revised page 08110-3 annotated Amendment No. 0003, attached hereto.

(8) Section 08210 - WOOD DOORS: Please delete page 08210-3 in its entirety and substitute revised page 08210-3 annotated Amendment No. 0003, attached hereto.

(9) Section 09100 - METAL SUPPORT FACILITIES: Please add new section 09100, 2 pages, annotated Amendment No. 0003, attached hereto.

(10) Section 09310 - CERAMIC TILE: Please delete pages 09310-1 through 09310-5 in their entirety and substitute revised pages 09310-1 through 09310-4 annotated Amendment No. 0003, attached hereto.

(11) Section 09510 - ACOUSTICAL CEILINGS: Please delete pages 09510-1 through 09510-6 in their entirety and substitute revised pages 09510-1 through 09510-5 annotated Amendment No. 0003, attached hereto.

(12) Section 09650 - RESILIENT FLOORING: Please delete pages 09650-1 through 09650-5 in their entirety and substitute revised pages 09650-1 through 09650-5 annotated Amendment No. 0003, attached hereto.

14. DESCRIPTION OF AMENDMENT (continued)

(13) Section 09900 - PAINTS AND COATINGS: Please delete page 09900-7 in its entirety and substitute revised page 09900-7 annotated Amendment No. 0003, attached hereto.

(14) Section 11601 - LABORATORY FUMEHOODS: Please delete pages 11601-1 and 11601-2 in their entirety and substitute revised pages 11601-1 and 11601-2 annotated Amendment No. 0003, attached hereto.

(15) Section 13080 - SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT: Please delete this section in its entirety.

(16) Section 15070 - SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT: Please delete this section in its entirety.

(17) Section 15080 - THERMAL INSULATION FOR MECHANICAL SYSTEMS: Please delete pages 15080-1 through 15080-26 in their entirety and substitute revised pages 15080-1 through 15080-21 annotated Amendment No. 0003, attached hereto.

(18) Section 15185 - LOW TEMPERATURE WATER HEATING SYSTEMS: Please delete pages 15185-1 through 15185-17 in their entirety and substitute revised pages 15185-1 through 15185-16 annotated Amendment No. 0003, attached hereto.

(19) Section 15990 - TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS: Please delete pages 15990-1 through 15990-7 in their entirety and substitute revised pages 15990-1 through 15990-6 annotated Amendment No. 0003, attached hereto.

(20) Section 16710 - BUILDING TELECOMMUNICATIONS CABLING SYSTEM: Please delete 16710-3 and 16710-13 in their entirety and substitute revised pages 16710-3 and 16710-13 annotated Amendment No. 0003, attached hereto.

c. **CONTRACT DRAWINGS:** Please delete Drawing Sheets A2, A4, A5, M6, P1, P2, and E1 in their entirety and substitute revised drawings of the same numbers, all with a revision date of 25 Jul 2005, attached hereto.

d. Please indicate receipt of this amendment on Standard Form 1442 (SOLICITATION, OFFER, AND AWARD) as Amendment No. 0003. Failure to acknowledge all amendments may be cause for rejection of the offer.

SECTION 00800
SPECIAL CLAUSES

1.1

INDEX

PARA	TITLE
SC-1	COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK
SC-2	LIQUIDATED DAMAGES - CONSTRUCTION
SC-3	CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS
SC-4	PHYSICAL DATA
SC-5	LIMITATION ON SUBCONTRACTING
SC-6	ENVIRONMENTAL LITIGATION
SC-7	AVAILABILITY AND USE OF UTILITY SERVICES
SC-8	EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE
SC-9	CERTIFICATES OF COMPLIANCE
SC-10	WARRANTY OF CONSTRUCTION
SC-11	PERFORMANCE EVALUATION OF CONTRACTOR
SC-12	SPECIAL 8 (a) CONTRACT CONDITIONS
SC-13	INSURANCE REQUIREMENTS
SC-14	PARTNERING

SPECIAL CLAUSES

2.1 SC-1 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)

The Contractor shall be required to (a) commence work under this contract within 10 calendar days after the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire base bid construction work ready for use not later than 270 calendar days after the date the Contractor receives the notice to proceed. **The Contracting Officer has the right to award Options 1 through 6 up to 56 days after the Contractor receives the notice to proceed for the base contract.** The contract will be extended 60 calendar days if any one or all of options 1 through 5 are awarded. The contract will not be extended if option 6 is awarded. The time stated for completion shall include final cleanup of the premises. (FAR 52.211-10)

2.2 SC-2 LIQUIDATED DAMAGES - CONSTRUCTION (SEP 2000)

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$300.00 for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause. (FAR 52.211-12)

2.3 SC-3 CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS (AUG 2000)

a. The Government will provide to the Contractor, without charge, one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.

b. The Contractor shall--

- (1) Check all drawings furnished immediately upon receipt;
- (2) Compare all drawings and verify the figures before laying out the work;
- (3) Promptly notify the Contracting Officer of any discrepancies;
- (4) Be responsible for any errors that might have been avoided by complying with this paragraph (b); and
- (5) Reproduce and print contract drawings and specifications as needed.

c. In general--

- (1) Large-scale drawings shall govern small-scale drawings; and
- (2) The Contractor shall follow figures marked on drawings in preference to scale measurements.

d. Omissions from the drawings or specifications or the misdescription of details of work that are manifestly necessary to carry out the intent of

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01010 SUMMARY OF WORK
01060 SAFETY
01320 PROJECT SCHEDULE
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01355 ENVIRONMENTAL PROTECTION
01420 SOURCES FOR REFERENCE PUBLICATIONS
01451 CONTRACTOR QUALITY CONTROL
01500 TEMPORARY CONSTRUCTION
01670 RECYCLED / RECOVERED MATERIALS
01781 OPERATION AND MAINTENANCE DATA

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02220 DEMOLITION

DIVISION 03 - CONCRETE

03307 CONCRETE FOR MINOR STRUCTURES

DIVISION 04 - MASONRY

04200 MASONRY

DIVISION 05 - METALS

05120 STRUCTURAL STEEL

DIVISION 06 - WOOD AND PLASTICS

06100 ROUGH CARPENTRY
06410 LAMINATE CLAD ARCHITECTURAL CASEWORK

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07840 FIRESTOPPING
07920 JOINT SEALANTS

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08710 DOOR HARDWARE

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09250 GYPSUM BOARD
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09510 ACOUSTICAL CEILINGS
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10800 TOILET ACCESSORIES

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13930 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

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15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS
15185 LOW TEMPERATURE WATER HEATING SYSTEM
15400 PLUMBING, GENERAL PURPOSE
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16402 INTERIOR DISTRIBUTION SYSTEM
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-- End of Project Table of Contents --

SUBMITTAL REGISTER

TITLE AND LOCATION					CONTRACTOR															
Lab Renovation, Bldg 29, Navy Ship Building Support Facility					G O V T C L A S S I F I C A T I O N	P A R A G R A P H	DESCRIPTION ITEM SUBMITTED	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
A C T I V I T Y N O	T R A N S M I T T A L N O	S P E C S E C T	(a)	(b)				(c)	(d)	(e)	(f)	(g)		(h)	(i)	(j)	(k)			(l)
		04200					Admixtures for Masonry Mortar	2.8.1	FIO											
							Admixtures for Grout	2.10.1	FIO											
							SD-08 Manufacturer's Instructions													
							Masonry Cement	2.8.4	FIO											
		05120					SD-02 Shop Drawings													
							Fabrication drawings		G D O											
							SD-07 Certificates													
							Steel	2.1	FIO											
							Bolts, nuts, and washers	2.2	FIO											
							Galvanizing	2.5	FIO											
		06100					SD-07 Certificates													
							Grading and Marking	2.1.1	FIO											
		06410					SD-02 Shop Drawings													
							Shop Drawings	1.8	FIO											
							Installation	3.1	FIO											
							SD-03 Product Data													
							Wood Materials	2.1	FIO											
							Wood Finishes	2.10	FIO											
							Finish Schedule		FIO											
							Chemical Resistant Laminate		FIO											
							SD-04 Samples													
							Plastic Laminates		FIO											
							Chemical Resistant Laminate		FIO											
							Cabinet Hardware	2.7	FIO											
							SD-07 Certificates													
							Quality Assurance	1.4	FIO											

SUBMITTAL REGISTER

TITLE AND LOCATION					CONTRACTOR												
Lab Renovation, Bldg 29, Navy Ship Building Support Facility																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARRA GR# APPH	GOVT OR CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION	CODE		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		06410	Laminate Clad Casework	3.1	FIO												
			Chemical Resistant Laminate		FIO												
		07212	SD-03 Product Data														
			Blanket insulation	2.1	FIO												
			Accessories	2.6	FIO												
			SD-08 Manufacturer's Instructions														
			Insulation	3.3.1	FIO												
		07840	SD-02 Shop Drawings														
			Firestopping Materials	2.1	FIO												
			SD-07 Certificates														
			Firestopping Materials	2.1	FIO												
			Installer Qualifications	1.5	FIO												
			Inspection	3.3	FIO												
		07920	SD-03 Product Data														
			Sealants	2.1	FIO												
			Primers	2.2	FIO												
			Bond breakers	2.3	FIO												
			Backstops	2.4	FIO												
			SD-07 Certificates														
			Sealant	3.3.6	FIO												
		08110	SD-02 Shop Drawings														
			Doors	2.1	G DO												
			Frames	2.7	G DO												
			Accessories	2.5	FIO												
			Weatherstripping	2.9	FIO												
			Schedules	#.1	G DO												

SUBMITTAL REGISTER

TITLE AND LOCATION										CONTRACTOR										
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ACTIVITY NO	TRANSMITTAL NO	S E C T	DESCRIPTION ITEM SUBMITTED	(c)	(d)	(e)	(f) GOVT OR CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
								SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	A C T I O N	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	A C T I O N	C O D E			DATE OF ACTION
								(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	
		08110	SD-03 Product Data																	
			Doors			2.1	G DO													
			Frames			2.7	G DO													
			Accessories			2.5	FIO													
			Weatherstripping			2.9	FIO													
		08210	SD-02 Shop Drawings																	
			Doors			2.1	G DO													
			SD-03 Product Data																	
			Doors			2.1	G DO													
			Accessories			2.2	FIO													
			warranty			1.4	FIO													
			Fire resistance rating			2.1.7	G DO													
			SD-04 Samples																	
			Doors			2.1	FIO													
			Door finish colors				G DO													
			SD-06 Test Reports																	
			Split resistance			2.4	FIO													
			Cycle-slam			2.4	FIO													
			Hinge loading resistance			2.4	FIO													
		08710	SD-02 Shop Drawings																	
			Hardware schedule			1.3	G D0													
			Keying system			2.3.8	FIO													
			SD-03 Product Data																	
			Hardware items			2.3	G DO													
			SD-08 Manufacturer's Instructions																	
			Installation			3.1	FIO													

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TITLE AND LOCATION					CONTRACTOR												
Lab Renovation, Bldg 29, Navy Ship Building Support Facility																	
ACTIVITY NO	TRANSMITTAL NO	SPEC NO	DESCRIPTION ITEM SUBMITTED	PARRA# APPH	GOVTOR CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(r)	
		08710	SD-10 Operation and Maintenance														
			Data														
			Hardware Schedule	1.3	G DO												
			SD-11 Closeout Submittals														
			Key bitting	1.4	FIO												
		09100	SD-02 Shop Drawings														
			Metal support systems	2.1	G DO												
		09250	SD-03 Product Data														
			Water-Resistant Gypsum Backing	2.1.3	FIO												
			Board														
			Accessories	2.1.14	FIO												
			SD-07 Certificates														
			Asbestos Free Materials	2.1	G DO												
		09310	SD-03 Product Data														
			Tile	2.1	G DO												
			Setting-Bed		FIO												
			Mortar, Grout, and Adhesive	2.4	FIO												
			SD-04 Samples														
			Tile	2.1	G DO												
			Accessories		FIO												
			Grout		G DO												
			SD-07 Certificates														
			Tile	2.1	FIO												
			Mortar, Grout, and Adhesive	2.4	FIO												
		09510	SD-02 Shop Drawings														
			Approved Detail Drawings	1.3	FIO												

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	09510		SD-03 Product Data															
			Acoustical Ceiling Systems		FIO													
			SD-04 Samples															
			Acoustical Units	2.1	FIO													
			SD-06 Test Reports															
			Ceiling Attenuation Class and Test		FIO													
			SD-07 Certificates															
			Acoustical Units	2.1	FIO													
	09650		SD-02 Shop Drawings															
			Resilient Flooring and Accessories	2.17	G DO													
			SD-03 Product Data															
			Resilient Flooring and Accessories	2.17	G DO													
			Adhesives	2.13	FIO													
			SD-04 Samples															
			Resilient Flooring and Accessories	2.17	G DO													
			SD-06 Test Reports															
			Moisture, Alkalinity and Bond Tests	3.3	G DO													
			SD-08 Manufacturer's Instructions															
			Surface Preparation	3.2	G DO													
			Installation	3.1	G DO													

SUBMITTAL FORM, Jan 96

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PREVIOUS EDITION IS OBSOLETE

SUBMITTAL REGISTER

TITLE AND LOCATION					CONTRACTOR												
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ACTIVITY NO	TRANSMITTAL NO	S E C T	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	G O V T C L A S S I F I C A T I O N	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		09650	SD-10 Operation and Maintenance Data														
			Resilient Flooring and Accessories	2.17	G DO												
		09900	SD-02 Shop Drawings														
			Piping identification stencil	3.12	FIO												
			SD-03 Product Data	3.12	FIO												
			Coating	2.1	G DO												
			Manufacturer's Technical Data	2.1	FIO												
			Sheets														
			SD-04 Samples														
			Color	1.9	G DO												
			SD-07 Certificates														
			Applicator's qualifications	1.3	FIO												
			SD-08 Manufacturer's Instructions														
			Application instructions	3.4.1	FIO												
			Mixing	3.8.2	FIO												
			Manufacturer's Material Safety	1.7.2	FIO												
			Data Sheets														
			SD-10 Operation and Maintenance														
			Data														
			Coatings:	2.1	G DO												
		10153	SD-02 Shop Drawings														
			Installation	3.1	G DO												
			SD-03 Product Data														

SUBMITTAL REGISTER

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A C T I V I T Y N O	T R A N S M I T T A L N O	S P E C S E C T	(a)	(b)	(c)				(d)	(e)	(f)	(g)	(h)		(i)	(j)	(k)	(l)			(m)
					10153		1.3	Toilet Partition System													
								SD-04 Samples													
							2.5	Colors and Finishes													
					10800			SD-03 Product Data													
							2.1.2	Finishes													
							2.2	Accessory Items													
					11601			SD-02 Shop Drawings													
							1.4.2	layout													
								SD-03 Product Data													
							2.2.2	Fumehood assembly													
							1.4.1	SD-04 Samples													
								Exterior hood paint													
								SD-06 Test Reports													
							1.4.2	Fumehood test													
							1.4.2	cabinet test													
								SD-08 Manufacturer's Instructions													
							2.2.2	Fumehood assembly													
								SD-10 Operation and Maintenance													
								Data													
							2.2.2	Fumehood assembly													
					13851			SD-02 Shop Drawings													
							1.4.1	Fire Alarm Reporting System													
								SD-03 Product Data													
							2.2	Storage Batteries													
								Voltage Drop													
							2.7.4	Special Tools and Spare Parts													

TITLE AND LOCATION					CONTRACTOR																	
Lab Renovation, Bldg 29, Navy Ship Building Support Facility					G O V T O R C L A S S I F I C A T I O N	P A R A G R A P H	DESCRIPTION ITEM SUBMITTED	(c)	(b)	(a)	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		13851	Trainig		FIO																	
			Testing	3.5	FIO																	
			SD-06 Test Reports																			
			Testing	3.5	FIO																	
			SD-07 Certificates																			
			Equipment	1.4.6	FIO																	
			Qualifications	1.3.7	FIO																	
		13930	SD-02 Shop Drawings																			
			Shop Drawings	1.12	G DO																	
			As-Built Drawings	3.11	FIO																	
			SD-03 Product Data																			
			Fire Protection Related Submittals	3.1	FIO																	
			Sway Bracing	3.4.1	G DO																	
			Materials and Equipment	2.3	G DO																	
			Hydraulic Calculations	1.7	G DO																	
			Spare Parts	1.11	FIO																	
			Preliminary Tests	3.10	G DO																	
			Final Acceptance Test	3.11	G DO																	
			On-site Training	3.12	FIO																	
			Fire Protection Specialist	1.8	G DO																	
			Sprinkler System Installer	1.9	G DO																	
			SD-06 Test Reports																			
			Preliminary Test Report	3.11	G DO																	
			Final Acceptance Test Report	3.11	G DO																	
			SD-07 Certificates																			

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TITLE AND LOCATION					CONTRACTOR												
Lab Renovation, Bldg 29, Navy Ship Building Support Facility																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH#	GOVT OR CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(r)	
		13930	Inspection by Fire Protection Specialist	3.3	G DO												
			SD-10 Operation and Maintenance														
			Data														
			Operating and Maintenance Instructions	3.12	FIO												
		15080	SD-03 Product Data														
			General Materials	2.1	G DO												
			Adhesives	2.1.1	G DO												
			Sealants	2.1.13	G DO												
			Duct Insulation	2.3.1	G DO												
			Duct Insulation Jackets	2.3.4	G DO												
			Pipe Insulation Materials	2.2	G DO												
			Jackets	2.1.8	G DO												
		15185	SD-02 Shop Drawings														
			Hot water heating system	1.3.1	FIO												
			SD-03 Product Data														
			Pumps	2.3.1	G DO												
			Flow measuring equipment		FIO												
			Backflow preventers		FIO												
			Hot water heating pipe	2.1.1	G DO												
			SD-06 Test Reports														
			Hydrostatic test of piping system	3.3.1	FIO												
			Auxiliary equipment and	3.3.2	FIO												
			accessory tests														
			SD-07 Certificates														

TITLE AND LOCATION					CONTRACTOR																
Lab Renovation, Bldg 29, Navy Ship Building Support Facility					G O V T O R C L A S S I F I C A T I O N	P A R A G R A P H	DESCRIPTION ITEM SUBMITTED	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS		
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					15185		Report of prior installations	1.5.2.1	FIO												
							Welding procedures	1.5.2.2	FIO												
							Welder's qualifications	1.5.2.3	FIO												
					15400		SD-02 Shop Drawings														
							Plumbing System	3.9.1	G D O												
							SD-03 Product Data														
							Flush valve water closets	2.4.3	FIO												
							Wall hung lavatories	2.4.7	FIO												
							Emergency shower & eye wash		FIO												
							Cup sink		FIO												
							Service sinks	2.4.10	FIO												
							Pumps	2.12	G D O												
							Pumps	2.2.4	G D O												
							Backflow prevention assemblies	3.9.1.1	G D O												
							Welding	1.6.1	FIO												
							Vibration-Absorbing Features	3.4	G D O												
							SD-06 Test Reports														
							Tests, Flushing and Disinfection	3.9	FIO												
							Test of Backflow Prevention	3.9.1.1	G D O												
							Assemblies														
							SD-07 Certificates														
							Materials and Equipment	1.3	FIO												
							Bolts	2.1.1	FIO												
							SD-10 Operation and Maintenance														
							Data														
							Plumbing System	3.9.1	G D O												

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TITLE AND LOCATION					CONTRACTOR												
Lab Renovation, Bldg 29, Navy Ship Building Support Facility																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARRA# APPH	GOVTOR CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION	CODE		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(r)	
		15700	SD-02 Shop Drawings														
			Drawings	1.5.2	G DO												
			SD-03 Product Data														
			Materials and Equipment	2.1	G DO												
			Spare Parts	1.5.3	FIO												
			Posted Instructions		FIO												
			Verification of Dimensions	1.5.1	FIO												
			System Performance Tests	3.4	FIO												
			Demonstrations		FIO												
			SD-06 Test Reports														
			Refrigerant Tests, Charging, and	3.3	G DO												
			Start-Up														
			System Performance Tests	3.4	G DO												
			SD-07 Certificates														
			Materials and Equipment	2.1	FIO												
			Service Organization	2.1	FIO												
			SD-10 Operation and Maintenance														
			Data														
			Operation and Maintenance		FIO												
			Manuals														
		15895	SD-02 Shop Drawings														
			Drawings		G DO												
			SD-03 Product Data														
			Components and Equipment	2.1	G DO												
			Metallic Flexible Duct	2.6.1.1	G DO												

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Lab Renovation, Bldg 29, Navy Ship Building Support Facility																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARRA GR# APPH	GOVTOR CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		15895	Insulated Nonmetallic Flexible Duct Runouts	2.6.1.2	G DO												
			Duct Connectors	2.6.1.2	G DO												
			Duct Access Doors	2.6.2.1	G DO												
			Fire Dampers	2.6.2.2	G DO												
			Manual Balancing Dampers	2.6.2.3	G DO												
			Diffusers	2.6.5.1	G DO												
			Registers and Grilles	2.6.5.5	G DO												
			Louvers	2.6.6	G DO												
			Centrifugal Fans	2.7.1.1	G DO												
			In-Line Centrifugal Fans	2.7.1.2	G DO												
			Centrifugal Type Power Roof Ventilators	2.7.1.6	G DO												
			Ceiling Exhaust Fans	2.7.1.9	G DO												
			Variable Volume, Single Duct	2.9.3.2	G DO												
			Terminal Units (Air Valves)														
			Reheat Units	2.9.3.7	G DO												
			Test Procedures		FIO												
			Diagrams	3.1	G DO												
			Operation and Maintenance	3.9	FIO												
			Training														
			SD-06 Test Reports														
			Performance Tests	3.7	G DO												
			Performance Tests	3.9	G DO												
			SD-07 Certificates														
			Bolts		FIO												

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TITLE AND LOCATION					CONTRACTOR													
Lab Renovation, Bldg 29, Navy Ship Building Support Facility																		
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					SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION	DATE OF ACTION		DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION	CODE				DATE OF ACTION
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	15895	SD-08 Manufacturer's Instructions																
		Manufacturer's Installation	3.1	FIO														
		Instructions																
		Operation and Maintenance	3.9	FIO														
		Training																
		SD-10 Operation and Maintenance																
		Data																
		Operation and Maintenance	3.9	FIO														
		Manuals																
		Fire Dampers	2.6.2.2	G DO														
		Centrifugal Fans	2.7.1.1	G DO														
		Ceiling Exhaust Fans	2.7.1.9	G DO														
		Variable Volume, Single Duct		G DO														
		Terminal Units																
		Reheat Units	2.9.3.7	G DO														
	15910	SD-01 Preconstruction Submittals																
		List of Drawings	1.8.4.1	G DO														
		List of Symbols and Abbreviations	1.8.4.2	G DO														
		Used on Drawings																
		List of I/O Points	1.8.4.3	G DO														
		Equipment Components List	1.8.4.4	G DO														
		AC Power Table	1.8.4.5	G DO														
		SD-02 Shop Drawings																
		Control system schematic	1.5.1.1	G DO														
		Ladder diagrams	1.5.1.2	G DO														
		Component wiring diagrams	1.5.1.3	G DO														

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TRANSMITTAL NO	S E C T	DESCRIPTION ITEM SUBMITTED	P A R A G R A P H	G O V T C L A S S I F I C A T I O N	(e)	(d)	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/	DATE RCD FRM APPR AUTH	REMARKS
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	15910		Controls and HVAC System Operators Manual	1.8.10	G DO														
			DDC Manufacturer's Hardware and Software Manuals	1.8.11	G DO														
			SD-11 Closeout Submittals																
			Training Course Documentation	1.8.7	G DO														
			Service organizations	1.8.8	G DO														
			Contractor certification	1.8.9	G DO														
	15990		SD-02 Shop Drawings																
			TAB Schematic Drawings and Report Forms	3.3	G DO														
			SD-03 Product Data																
			TAB Related HVAC Submittals	3.2	FIO														
			TAB Procedures	3.5.1	G DO														
			Calibration	1.4	FIO														
			TAB Execution	3.5.1	G DO														
			TAB Verification		G DO														
			SD-06 Test Reports																
			Design Review Report	3.1	G DO														
			TAB Report	3.5.3	G DO														
			SD-07 Certificates																
			TAB Firm	1.5.1	G DO														
			TAB Specialist	1.5.2	G DO														
	15995		SD-03 Product Data																
			Commissioning Team	3.1	FIO														
			Tests	3.2	FIO														

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Lab Renovation, Bldg 29, Navy Ship Building Support Facility						CONTRACTOR: SCHEDULE DATES				CONTRACTOR ACTION			APPROVING AUTHORITY					
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH#	GOVTOR CLASSIFICATION	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
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	15995		Pre-Commissioning Checks	3.2.1	FIO													
			SD-06 Test Reports															
			Test Reports	3.2	G DO													
	16402		SD-02 Shop Drawings															
			Panelboards	2.15	G DO													
			Marking strips	3.1.14.1	G DO													
			SD-03 Product Data															
			Receptacles	2.14	G DO													
			Circuit breakers	2.15.3	G DO													
			Switches	2.12	G DO													
			Grounding Busbar		G DO													
			SD-06 Test Reports															
			600-volt wiring test		G DO													
			Grounding system test		G DO													
			Ground-fault receptacle test	3.5.4	G DO													
			SD-10 Operation and Maintenance															
			Data															
			Electrical Systems	1.5.1	G DO													
	16510		SD-03 Product Data															
			Fluorescent lighting fixtures	2.1	G DO													
			Fluorescent electronic ballasts	1.6.1	G DO													
			Fluorescent lamps	2.1.6	G DO													
			Incandescent lighting fixtures	2.3	G DO													
			Incandescent lamps	2.3.1	G DO													
			Exit signs	2.12	G DO													
			Emergency lighting equipment	2.13	G DO													

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of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at

all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, **or have** a minimum of 10 years construction experience on construction similar to this contract. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned as System Manager but may have duties as **superintendent and** safety representative in addition to quality control. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 Additional Requirement

In addition the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered at the Corps of Engineers Philadelphia District Office and other Corps of Engineer Districts.

3.4.4 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 15995 COMMISSIONING OF HVAC SYSTEMS is included in the contract, the submittals required by those sections shall be coordinated with Section 01330 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced

SECTION 01500

TEMPORARY CONSTRUCTION

PART 1 GENERAL

1.1 SCOPE OF SECTION

The work covered by this section consists of furnishing all labor, materials, plant and equipment, and performing all operations required for the construction of storage areas, and service facilities needed for execution and completion of the work.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

NOTE: Any submittals classified as "SD-01 Preconstruction Submittals" require approval prior to mobilization to the contract work site. All other submittals, classified as "SD-02" through "SD-11," require approval prior to commencing the particular task to which the submittal is associated.

SD-01 Preconstruction Submittals

Temporary Facilities Plan; G,COR.

The Contractor shall submit to the Contracting Officer for approval, prior to the start of work, its plans showing the layout and details of all temporary facilities to be used for this contract, including the proposed locations of staging areas.

PART 2 PRODUCTS

2.1 **DELETED**

PART 3 EXECUTION

3.1 STAGING AREA

The contractor shall be permitted to utilize the area within the line of work limit inside Building 29 as shown on the drawings as a secure staging area.

3.2 CONTRACTOR'S PROJECT OFFICES

A Contractor's project office is not required for this contract. However, the Contractor shall, at all times during the contract period, be equipped and staffed to provide essential information to the Contracting Officer or its authorized representative. **The Government will provide an inside office area with two telephones at no cost to the Contractor.** The Contractor shall be equipped with a mobile telephone, a copy of all drawings and

specifications, copies of all pending and approved submittals, daily report, test reports and other pertinent information, and shall at all times give the Contracting Officer access thereto.

3.3 PROTECTION

3.3.1 Environmental Protection

The work shall comply with the requirements of Section 01355 ENVIRONMENTAL PROTECTION.

3.4 MEASUREMENT AND PAYMENT

No separate measurement or payment will be made for the work specified in this section and all costs in connection therewith shall be included in the costs of all the bid items.

-- End of Section --

SECTION 06410

LAMINATE CLAD ARCHITECTURAL CASEWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds (2003) AWI Quality Standards

ASTM INTERNATIONAL (ASTM)

ASTM F 547 (2001) Nails for Use with Wood and
Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.9 (2003) Cabinet Hardware

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

**FS L-P-508-H (1977) Plastic Sheet, Laminated,
Decorative and Nondecorative**

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3 (2000) High-Pressure Decorative Laminates

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 1-A (1997) Architectural Wood Flush Doors

1.2 GENERAL DESCRIPTION

Work in this section includes laminate clad custom casework cabinets as shown on the drawings and as described in this specification. This Section includes **chemical resistant** laminate surfacing and cabinet hardware. The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. All items designated with a "G", including product literature, calculations, component data, certificates, diagrams, drawings, and samples shall be submitted concurrently in one complete system submittal. Omission of any required submittal item from the package shall be sufficient cause for disapproval

of the entire submittal. Unless otherwise indicated in the submittal review commentary, disapproval of any item within the package shall require a re-submittal of the entire system package, in which all deficiencies shall be corrected. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings
Installation

Shop drawings showing all fabricated casework items in plan view, elevations and cross-sections to accurately indicate materials used, details of construction, dimensions, methods of fastening and erection, and installation methods proposed. Shop drawing casework items shall be clearly cross-referenced to casework items located on the project drawings. Shop drawings shall include a color schedule of all casework items to include all countertop, exposed, and semi-exposed cabinet finishes to include finish material manufacturer, pattern, and color.

SD-03 Product Data

Wood Materials
Wood Finishes
Finish Schedule
Chemical Resistant Laminate

Descriptive data which provides narrative written verification of all types of construction materials and finishes, methods of construction, etc. not clearly illustrated on the submitted shop drawings. Data shall provide written verification of conformance with AWI Qual Stds for the quality indicated to include materials, tolerances, and types of construction. Both the manufacturer of materials and the fabricator shall submit available literature which describes re-cycled product content, operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

SD-04 Samples

Plastic Laminates
Chemical Resistant Laminate

Two samples of each **chemical resistant** laminate pattern and color. Samples shall be a minimum of 5 by 7 inches in size.

Cabinet Hardware

One sample of each cabinet hardware item specified to include hinges, pulls, drawer glides, and catches.

SD-07 Certificates

Quality Assurance
Laminate Clad Casework

Chemical Resistant Laminate

A quality control statement which illustrates compliance with and understanding of AWI Qual Stds requirements, in general, and the specific AWI Qual Stds requirements provided in this specification. The quality control statement shall also certify a minimum of ten years contractor's experience in **chemical resistant** laminate clad casework and countertop fabrication and construction. The quality control statement shall provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

1.4 QUALITY ASSURANCE

Unless otherwise noted on the drawings, all materials, construction methods, and fabrication shall conform to and comply with the premium grade quality standards as outlined in AWI Qual Stds, Section 400G and Section 400B for laminate clad cabinets. These standards shall apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Contractor must demonstrate knowledge and understanding of AWI Qual Stds requirements for the quality grade indicated.

1.5 DELIVERY AND STORAGE

Casework may be delivered knockdown or fully assembled. All units shall be delivered to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area shall be well ventilated and not subject to extreme changes in temperature or humidity.

1.6 SEQUENCING AND SCHEDULING

Work shall be coordinated with other trades. Units shall not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets shall be installed before finished flooring materials are installed.

1.7 PROJECT/SITE CONDITIONS

Field measurements shall be verified as indicated in the shop drawings before fabrication.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

2.1.1 Lumber

a. All framing lumber shall be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, shall be nominal 3/4 inch hardwood.

b. AWI grade shall be premium. Location, shape, and dimensions shall be as indicated on the drawings.

2.1.2 Panel Products

2.1.2.1 Plywood

All plywood panels used for framing purposes shall be veneer core hardwood plywood, AWI Qual Stds Grade AA. Nominal thickness of plywood panels shall be as indicated in this specification and on the drawings.

2.2 CHEMICAL RESISTANT LAMINATE

All laminate shall be chemical resistant, Style D, Type II, Class 1, in accordance with FS L-P-508-H. Chemical resistant laminate shall be Chemtop2 as manufactured by Formica Corporation, Cincinnati, Ohio 45241, 800-FORMICA, <http://www.formica.com>, or approved equal. Material shall shall meet the requirements of NEMA LD 3.

2.3 CABINET HARDWARE

All hardware shall conform to BHMA A156.9, unless otherwise noted, and shall consist of the following components:

- a. Door Hinges: Reversible concealed type, BHMA No. B01501.
- b. Cabinet Pulls: Back mounted type, BHMA No. B02011.
- c. Drawer Slide: Side mounted self closing type, BHMA No. B05091 with full extension and a minimum 75 pound load capacity. Slides shall include an integral stop to avoid accidental drawer removal.
- d. Adjustable Shelf Support System:
 - 1) Recessed (mortised) metal standards, BHMA No. B04071. Support clips for the standards shall be open type, BHMA No. B04091 or closed type, BHMA No. B04081.
- e. Cabinet catches: Push-in magnetic type, BHMA No. B03131.

2.4 FASTENERS

Nails, screws, and other suitable fasteners shall be the size and type best suited for the purpose and shall conform to ASTM F 547 where applicable.

2.5 ADHESIVES, CAULKS, AND SEALANTS

2.5.1 Adhesives

Adhesives shall be of a formula and type recommended by AWI. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives shall meet local regulations regarding VOC emissions and off-gassing.

2.5.1.1 Wood Joinery

Adhesives used to bond wood members shall be a Type II for interior use urea-formaldehyde resin formula or polyvinyl acetate resin emulsion. Adhesives shall withstand a bond test as described in WDMA I.S. 1-A.

2.5.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be adhesive consistent with AWI and laminate manufacturer's recommendations. PVC edgebanding shall be adhered using a polymer-based hot melt glue.

2.5.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

2.5.3 Sealant

Sealant shall be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

2.6 WOOD FINISHES

Color and location shall be as indicated on the drawings.

2.7 FABRICATION

Fabrication and assembly of components shall be accomplished at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components shall meet or exceed the requirements for AWI premium grade unless otherwise indicated in this specification. Cabinet style, in accordance with AWI Qual Stds, Section 400-G descriptions, shall be flush overlay.

2.7.1 Base and Wall Cabinet Case Body

2.7.1.1 Cabinet Components

Frame members shall be glued-together, kiln-dried hardwood lumber. Top corners, bottom corners, and cabinet bottoms shall be braced with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Cabinet components shall be constructed from the following materials and thicknesses:

- a. Body Members (Ends, Divisions, Bottoms, and Tops): 3/4 inch veneer core plywood panel product.
- b. Face Frames and Rails: 3/4 inch hardwood lumber.
- c. Shelving: 3/4 inch veneer core plywood panel product.
- d. Cabinet Backs: 1/4 inch veneer core plywood panel product.
- e. Drawer Sides, Backs, and Subfronts: 1/2 inch panel product.
- f. Drawer Bottoms: 1/4 inch veneer core plywood panel product.
- g. Door and Drawer Fronts: 3/4-inch veneer core plywood panel product.

2.7.1.2 Joinery Method for Case Body Members

- a. Tops, Exposed Ends, and Bottoms.

1) Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

b. Exposed End Corner and Face Frame Attachment.

1) For non-mitered joint (90 degree): butt joint glued under pressure (no visible fasteners).

c. Cabinet Backs (Wall Hung Cabinets): Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Fabrication method shall be:

1) Full bound, captured in grooves on cabinet sides, top, and bottom. Cabinet backs for floor standing cabinets shall be side bound, captured in grooves; glued and fastened to top and bottom.

d. Cabinet Backs (Floor Standing Cabinets).

1) Side bound, captured in grooves; glued and fastened to top and bottom.

e. Wall Anchor Strips shall be required for all cabinets with backs less than 1/2 inch thick. Strips shall consist of minimum 1/2 inch thick lumber, minimum 2-1/2 inches width; securely attached to wall side of cabinet back - top and bottom for wall hung cabinets, top only for floor standing cabinets.

2.7.2 Cabinet Floor Base

Floor cabinets shall be constructed with an integral base. Finished height for each cabinet base shall be as indicated on the drawings. Bottom edge of the cabinet door or drawer face shall be flush with top of base.

2.7.3 Cabinet Door and Drawer Fronts

Door and drawer fronts shall be fabricated from 3/4 inch veneer core plywood. All door and drawer front edges shall be surfaced with high pressure plastic laminate to match exterior face laminate.

2.7.4 Drawer Assembly

2.7.4.1 Drawer Components

Drawer components shall consist of a removable drawer front, sides, backs, and bottom. Drawer components shall be constructed of the following materials and thicknesses:

a. Drawer Sides and Backs For Laminate Finish: 1/2 inch thick 7-ply hardwood veneer core substrate.

b. Drawer Bottom: 1/4 inch thick veneer core panel product for transparent or plastic laminate finish.

2.7.4.2 Drawer Assembly Joinery Method

a. Multiple dovetail (all corners) or French dovetail front/dadoed

back, glued under pressure.

2.7.5 Shelving

2.7.5.1 General Requirements

Shelving shall be fabricated from 3/4 inch veneer core plywood. All shelving top and bottom surfaces shall be finished with HPDL plastic laminate. Shelf edges shall be finished in a HPDL plastic laminate.

2.7.5.2 Shelf Support System

The shelf support system shall be:

a. Recessed (mortised) metal shelf standards. Standards shall be mortised flush with the finishes surface of the cabinet interior side walls, two per side. Standards shall be positioned and spaced on the side walls to provide a stable shelf surface that eliminates tipping when shelf front is weighted. Standards shall be installed and adjusted vertically to provide a level, stable shelf surface when clips are in place.

2.7.6 Chemical Resistant Laminate Countertops

Countertop and backsplash shall be 3/4 inch thick with chemical resistant laminate.

2.7.7 Laminate Application

Laminate application to substrates shall follow the recommended procedures and instructions of the laminate manufacturer and NEMA LD 3, using tools and devices specifically designed for laminate fabrication and application.

Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. **All laminate edges shall be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing shall be such that no overlap of the member eased is visible.**

2.7.8 Finishing

2.7.8.1 Filling

No fasteners shall be exposed on laminated surfaces.

2.7.8.2 Sanding

All surfaces requiring coatings shall be prepared by sanding with a grit and in a manner that scratches will not show in the final system.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall comply with applicable requirements for AWI Qual Stds premium quality standards. Countertops and fabricated assemblies shall be installed level, plumb, and true to line, in locations shown on the

drawings. Cabinets and other laminate clad casework assemblies shall be attached and anchored securely to the floor and walls with mechanical fasteners that are appropriate for the wall and floor construction.

3.1.1 Anchoring Systems

3.1.1.1 Floor

Base cabinets shall utilize a floor anchoring system. Anchoring and mechanical fasteners shall not be visible from the finished side of the casework assembly. Where assembly abutts a wall surface, anchoring shall include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

3.1.1.2 Wall

Cabinet to be wall mounted shall utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width; securely attached to the wall side of the cabinet back, both top and bottom.

3.1.2 Countertops

Countertops shall be installed in locations as indicated on the drawings. Countertops shall be fastened to supporting casework structure with mechanical fasteners, hidden from view. All joints formed by the countertop or countertop splash and adjacent wall surfaces shall be filled with a clear silicone caulk. Joints between the countertop surface and splash shall be filled with clear silicone caulk in a smooth consistent concave bead. Bead size shall be the minimum necessary to fill the joint and any surrounding voids or cracks.

3.1.3 Hardware

Casework hardware shall be installed in types and locations as indicated on the drawings.

3.1.4 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels shall be accomplished within target fitting tolerances for gaps and flushness in accordance with AWI Qual Stds premium grade requirements.

3.1.5 Plumbing Fixtures

Sinks, sink hardware, and other plumbing fixtures shall be installed in locations as indicated on the drawings and in accordance with Section 15400 PLUMBING, GENERAL PURPOSE.

-- End of Section --

Weatherstripping

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI A250.8 requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Strap knock-down frames in bundles. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

1.4 SCHEDULES

Submit door and frame locations.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI A250.8, except as specified otherwise. Prepare doors to receive hardware specified in Section 08710 DOOR HARDWARE. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1 3/4 inches thick, unless otherwise indicated.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Standard Duty Doors

SDI A250.8, Level 1, physical performance Level c, Model 1, of size(s) and design(s) indicated and core construction as required by the manufacturer. Provide where shown.

2.2 CUSTOM HOLLOW METAL DOORS

Provide custom hollow metal doors where nonstandard steel doors are indicated. At the Contractor's option, custom hollow metal doors may be provided in lieu of standard steel doors. Door size(s), design, materials, construction, gages, and finish shall be as specified for standard steel doors and shall comply with the requirement of NAAMM HMMA HMM. Fill all spaces in doors with insulation. Close top and bottom edges with steel channels not lighter than 16 gage. Close tops of exterior doors flush with an additional channel and seal to prevent water intrusion. Prepare doors to receive hardware specified in Section 08710 DOOR HARDWARE. Undercut doors where indicated. Doors shall be 1 3/4 inches thick, unless otherwise indicated.

2.3 INSULATED STEEL DOOR SYSTEMS

At the option of the Contractor, insulated steel doors and frames may be provided in lieu of Grade I standard steel doors and frames. Door size(s),

design, and material shall be as specified for standard steel doors. Insulated steel doors shall have a core of polyurethane foam and an R factor of 10.0 or more (based on a k value of 0.16); face sheets, edges, and frames of galvanized steel not lighter than 23 gage, 16 gage, and 16 gage respectively; magnetic weatherstripping; nonremovable-pin hinges; thermal-break aluminum threshold; and vinyl door bottom. Doors and frames shall receive phosphate treatment, rust-inhibitive primer, and baked acrylic enamel finish. Doors shall have been tested in accordance with ANSI A250.4 and shall have met the requirements for Level C. Prepare doors to receive hardware specified in Section 08710 DOOR HARDWARE. Doors shall be 1 3/4 inches thick. Provide insulated steel doors and frames where shown.

2.4 **DELETED**

2.5 ACCESSORIES

2.5.1 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.6 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI 113 and shall conform to:

- a. Rigid Polyurethane Foam: ASTM C 59/C 59M1, Type 1 or 2, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D 2863; or
- b. Rigid Polystyrene Foam Board: ASTM C 578, Type I or II; or
- c. Mineral board: ASTM C 612, Type I.

2.7 STANDARD STEEL FRAMES

SDI A250.8, except as otherwise specified. Form frames to sizes and shapes indicated, with knock-down field-assembled corners. Provide steel frames for doors unless otherwise indicated.

2.7.1 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.

2.7.2 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inches on centers.

specie. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

2.1.1.1 Interior Flush Doors

Provide **particleboard** core, Type II flush doors conforming to WDMA I.S. 1-A with faces of premium grade natural birch, **rotary cut** .

2.1.2 Fire Doors

Doors specified or indicated to have a fire resistance rating shall conform to the requirements of UL 10B, ASTM E 152, or NFPA 252 for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.2 ACCESSORIES

2.2.1 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings . Moldings for flush doors shall be lip type.

2.2.2 Additional Hardware Reinforcement

Provide fire rated doors with hardware reinforcement blocking. Size of lock blocks shall be as required to secure the hardware specified. Reinforcement blocking shall be in compliance with the manufacturer's labeling requirements and shall not be mineral material similar to the core.

2.3 FABRICATION

2.3.1 Marking

Each door shall bear a stamp, brand, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based, and identify doors having a Type I glue bond.

2.3.3 Adhesives and Bonds

WDMA I.S. 1-A. Use Type II bond for interior doors. Adhesive for doors to receive a natural finish shall be nonstaining.

2.3.4 Prefitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, bevelling edges, mortising, and drilling for hardware. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

2.3.5 Finishes

2.3.5.1 Field Painting

Doors shall be stained as specified in Section 09900 PAINTS AND COATINGS.

2.3.5.2 Color

Color of stain shall be as selected by the Contracting Officer from the color selection samples.

2.4 SOURCE QUALITY CONTROL

Stiles of "B" and "C" label fire doors utilizing standard mortise leaf hinges shall meet the following performance criteria:

- a. Split resistance: Average of ten test samples shall be not less than 500 pounds load when tested in accordance with WDMA TM-5.
- b. Cycle-slam: 200,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of WDMA TM-7.
- c. Hinge loading resistance: Average of ten test samples shall be not less than 700 pounds load when tested for direct screw withdrawal in accordance with WDMA TM-8 using a No. 12, 1 1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1 1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

PART 3 EXECUTION

3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inches. Door warp shall not exceed 1/4 inch when measured in accordance with WDMA I.S. 1-A.

3.1.1 Fire Doors

Install fire doors in accordance with NFPA 80. Do not paint over labels.

-- End of Section --

SECTION 09100

METAL SUPPORT ASSEMBLIES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 463/A 463M	(2002a) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 653/A 653M	(2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C 645	(2004a) Nonstructural Steel Framing Members
ASTM C 754	(2004) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal support systems; G, DO

Submit for the erection of metal framing,. Indicate materials, sizes, thicknesses, and fastenings.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A 653/A 653M, G-60; aluminum coating ASTM A 463/A 463M, T1-25; or a 55-percent aluminum-zinc coating.

2.1.1.1 Materials for Attachment of Gypsum Wallboard

2.1.1.1.1 Nonload-Bearing Wall Framing and Furring

ASTM C 645, but not thinner than 0.0329 inch thickness.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Gypsum Wallboard

3.1.1.1 Nonload-Bearing Wall Framing and Furring

ASTM C 754, except as indicated otherwise.

3.2 ERECTION TOLERANCES

Framing members which will be covered by finish materials such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:

- a. Layout of walls and partitions: 1/4 inch from intended position;
- b. Plates and runners: 1/4 inch in 8 feet from a straight line;
- c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
- d. Face of framing members: 1/4 inch in 8 feet from a true plane.

-- End of Section --

SECTION 09310

CERAMIC TILE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1 (1999) Installation of Ceramic Tile;
including A108.1A-C, 108.4-.13, 118.1-.10,
A136.1

ANSI A137.1 (1988) Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C 1027 (1999) Determining Visible Abrasion
Resistance of Glazed Ceramic Tile

ASTM C 1028 (1996) Determining the Static Coefficient
of Friction of Ceramic Tile and Other Like
Surfaces by the Horizontal Dynamometer
Pull-Meter Method

ASTM C 241 (1990; R 1997e1) Abrasion Resistance of
Stone Subjected to Foot Traffic

ASTM C 373 (1988; R 1999) Water Absorption, Bulk
Density, Apparent Porosity, and Apparent
Specific Gravity of Fired Whiteware
Products

ASTM C 648 (2004) Breaking Strength of Ceramic Tile

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual (2003) Dimension Stone Design Manual

TILE COUNCIL OF AMERICA (TCA)

TCA Hdbk (2003-2004) Handbook for Ceramic Tile
Installation

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Tile; G, DO
Setting-Bed
Mortar, Grout, and Adhesive

Manufacturer's catalog data and preprinted installation and cleaning instructions.

SD-04 Samples

Tile; G, DO
Accessories

Grout; G, DO

Samples of sufficient size to show color range, pattern, type and joints.

SD-07 Certificates

Tile
Mortar, Grout, and Adhesive

Certificates indicating conformance with specified requirements. A master grade certificate shall be furnished for tile.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover in accordance with manufacturer's instructions.

1.4 ENVIRONMENTAL REQUIREMENTS

Ceramic tile work shall not be performed unless the substrate and ambient temperature is at least 50 degrees F and rising. Temperature shall be maintained above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used they shall be vented to the outside to avoid carbon dioxide damage to new tilework.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period shall be provided.

1.6 EXTRA STOCK

Supply an extra two percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Tile shall be standard grade conforming to ANSI A137.1. Containers shall

be grade sealed. Seals shall be marked to correspond with the marks on the signed master grade certificate. Tile shall be impact resistant with a minimum breaking strength for wall tile of 90 lbs and 250 lbs for floor tile in accordance with ASTM C 648. Water absorption shall be 0.50 maximum percent in accordance with ASTM C 373. Floor tile shall have a minimum coefficient of friction of 0.50 wet and dry in accordance with ASTM C 1028. Floor tile shall be Class III-Medium Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic.

2.1.1 Floor Tile

Ceramic floor tile and trim shall be unglazed porcelain unpolished with sharply formed face. Tile size and color shall be as indicated on the drawings.

2.2 DELETED

2.3 WATER

Water shall be potable.

2.4 MORTAR, GROUT, AND ADHESIVE

Mortar, grout, and adhesive shall conform to the following:

2.4.1 Latex-Portland Cement Mortar

ANSI A108.1.

2.4.2 Ceramic Tile Grout

ANSI A108.1; sand portland cement grout.

2.4.3 Organic Adhesive

ANSI A108.1, Type I.

2.5 MARBLE THRESHOLDS

Marble thresholds shall be of size required by drawings or conditions. Marble shall be Group A as classified by MIA Design Manual. Marble shall have a fine sand-rubbed finish and shall be gray in color as approved by the Contracting Officer. Marble abrasion shall be not less than 12.0 when tested in accordance with ASTM C 241.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Surface to receive tile shall be inspected and shall conform to the requirements of ANSI A108.1 for surface conditions for the type setting bed specified and for workmanship.

3.2 GENERAL INSTALLATION REQUIREMENTS

Tile in colors and patterns indicated shall be applied in the area shown on the drawings. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown. Special shapes shall be

provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Tile bases and coves shall be solidly backed with mortar.

3.3 INSTALLATION OF FLOOR TILE

Floor tile shall be installed in accordance with TCA Hdbk, method **113**.

3.3.1 Deleted

3.3.2 *Latex-Portland Cement*

Latex-portland cement mortar shall be used to install tile directly over properly cured, plane, clean concrete slabs in accordance with ANSI A108.1.

3.3.3 Ceramic Tile Grout

Ceramic Tile grout shall be prepared and installed in accordance with ANSI A108.1.

3.4 INSTALLATION OF MARBLE THRESHOLDS

Thresholds shall be installed where indicated in a manner similar to that of the ceramic tile floor. Thresholds shall be the full width of the opening. Head joints at ends shall not exceed 1/4 inch in width and shall be grouted full as specified for ceramic tile.

3.5 CLEANING AND PROTECTING

Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen. Damaged or defective tiles shall be replaced.

-- End of Section --

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A 641/A 641M	(2003) Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C 635	(2004) Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C 636	(2004) Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E 1264	(1998) Acoustical Ceiling Products
ASTM E 1477	(1998a; R 2003) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E 580	(2002e1) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint
ASTM E 795	(2000) Mounting Test Specimens During Sound Absorption Tests

U.S. ARMY CORPS OF ENGINEERS (USACE)

TI 809-04	(1998) Seismic Design for Buildings
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UNDERWRITERS LABORATORIES (UL)

UL Fire Resist Dir	(2004) Fire Resistance Directory
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings

Drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan.

SD-03 Product Data

Acoustical Ceiling Systems

Manufacturer's descriptive data, catalog cuts, and installation instructions. Submittals which do not provide adequate data for the product evaluation will be rejected.

SD-04 Samples

Acoustical Units

Two samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color.

SD-06 Test Reports

Ceiling Attenuation Class and Test

Reports by an independent testing laboratory attesting that acoustical ceiling systems meet specified requirements. Data attesting to conformance of the proposed system to Underwriters Laboratories requirements for the fire endurance rating listed in UL Fire Resist Dir may be submitted in lieu of test reports.

SD-07 Certificates

Acoustical Units

Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

1.3 GENERAL REQUIREMENTS

Acoustical treatment shall consist of sound controlling units mechanically mounted on a ceiling suspension system. The unit size, texture, finish, and color shall be as specified. The location and extent of acoustical treatment shall be as shown on the approved detail drawings.

1.3.1 Light Reflectance

Determine light reflectance factor in accordance with ASTM E 1477 Test Method.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Materials shall be carefully handled and stored in dry, watertight enclosures. Immediately before installation, acoustical units shall be stored for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature

and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

A uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent shall be maintained for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Interior finish work such as plastering, concrete and terrazzo work shall be complete and dry before installation. Mechanical, electrical, and other work above the ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided. Standard performance guarantee or warranty shall contain an agreement to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

1.8 EXTRA MATERIALS

Spare tiles of each color shall be furnished at the rate of 5 tiles for each 1000 tiles installed. Tiles shall be from the same lot as those installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. Acoustical units shall conform to ASTM E 1264, Class A, and the following requirements:

2.1.1 Units for Exposed-Grid System (ACT)

Type: III (non-asbestos mineral fiber with painted finish), **Form 2.**

Minimum NRC: 0.55 when tested on mounting Type E-400 of ASTM E 795.

Pattern: **C or D.**

Nominal size: 24 by 24 inches.

Edge detail: Square Edge.

Finish: Factory-applied color finish.

Minimum LR coefficient: .82.

Minimum CAC: 33.

Flame Spread: Class A, 25 or less

2.1.2 Melt-Away Ceiling Tiles (Option 6)

Melt-away ceiling tiles shall be as manufactured by Empire West Ince, 9270 Graton Rd., Graton, CA 95444, 800-521-4261, or approved equal. Ceiling tiles shall be fabricated of polystyrene specifically rated, listed and approved for installation under sprinkler systems. The panels shall be designed to drop from the suspension system in the event of a fire.

2.2 SUSPENSION SYSTEM

Suspension system shall be exposed-grid, and shall conform to ASTM C 635 for intermediate-duty systems. Surfaces exposed to view shall be aluminum or steel with a factory-applied white baked-enamel finish. Wall molding shall have a flange of not less than 15/16 inch. Mitered corners shall be provided. Suspended ceiling framing system shall have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. The suspension system shall have a maximum deflection of 1/360 of span length. Seismic details shall conform to the guidance in TI 809-04 and ASTM E 580 as shown on the drawings.

2.3 HANGERS

Hangers and attachment shall support a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.3.1 Wires

Wires shall conform to ASTM A 641/A 641M, Class 1, 0.106 inches in diameter.

2.4 FINISHES

Acoustical units and suspension system members shall have manufacturer's standard textures, patterns and finishes as specified. Ceiling suspension system components shall be treated to inhibit corrosion.

2.5 COLORS AND PATTERNS

Colors and patterns for acoustical units and suspension system components shall be indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Areas where acoustical units will be cemented shall be free of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Mechanical, electrical, and other work above the ceiling line shall be completed and approved prior to the start of acoustical ceiling installation. Acoustical work shall be provided complete with necessary fastenings, clips, and other accessories required for a complete installation. Mechanical fastenings shall not be exposed in the finished work. Hangers shall be laid out for each individual room or space. Hangers shall be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Main runners and carrying channels shall be kept clear of abutting walls and partitions.

At least two main runners shall be provided for each ceiling span. Wherever required to bypass an object with the hanger wires, a subsuspension system shall be installed, so that all hanger wires will be plumb.

3.1.1.1 Suspension System

Suspension system shall be installed in accordance with ASTM C 636 and as specified herein.

3.1.1.1.1 Plumb Hangers

Hangers shall be plumb and shall not press against insulation covering ducts and pipes. See Section 16510 INTERIOR LIGHTING for additional lighting installation requirements.

3.1.1.1.2 Splayed Hangers

Where hangers must be splayed (sloped or slanted) around obstructions, the resulting horizontal force shall be offset by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Wall molding shall be provided where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Wall molding shall be secured not more than 3 inches from ends of each length and not more than 16 inches on centers between end fastenings. Wall molding springs shall be provided at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Acoustical units shall be installed in accordance with the approved installation instructions of the manufacturer. Edges of acoustical units shall be in close contact with metal supports, with each other, and in true alignment. Acoustical units shall be arranged so that units less than one-half width are minimized. Units shall be held in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating, except hold-down clips for melt-away ceiling tiles (Option 6) shall only be used if specifically recommended by the manufacturer.

3.2 CLEANING

Following installation, dirty or discolored surfaces of acoustical units shall be cleaned and left free from defects. Units that are damaged or improperly installed shall be removed and new units provided as directed.

-- End of Section --

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SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4078	(2002) Water Emulsion Floor Polish
ASTM E 648	(2003) Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F 1066	(2004) Vinyl Composition Floor Tile
ASTM F 1861	(2002) Resilient Wall Base
ASTM F 1869	(2004) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F 2170	(2002) Determining Relative Humidity in Concrete Floor Slabs in situ Probes
ASTM F 710	(2003) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.2 FIRE RESISTANCE REQUIREMENTS

Flooring in corridors and exits shall have a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E 648.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Resilient Flooring and Accessories; G, DO

Scaled drawings indicating patterns (including location of patterns and colors) and dimensions.

SD-03 Product Data

Resilient Flooring and Accessories; G, DO

Manufacturer's descriptive data.

Adhesives

Manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics. Material Safety Data Sheets (MSDS) for all primers and adhesives shall be provided to the Contracting Officer. Highlight VOC emissions.

SD-04 Samples

Resilient Flooring and Accessories; G, DO

Three samples of each indicated color and type of flooring, base, mouldings, and accessories. Sample size shall be minimum 2-1/2 x 4 inches.

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G, DO

Copy of test reports of moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

SD-08 Manufacturer's Instructions

Surface Preparation; G, DO
Installation; G, DO

Manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G, DO

Data Package 1 in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Materials shall be stored in a clean dry area with temperature maintained above 68 degrees F and below 85 degrees F, and shall be stacked according to manufacturer's recommendations. Materials shall be protected from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Do not open containers until materials are to be used, except for verification inspection. Observe ventilation and safety procedures specified in the MSDS.

1.5 ENVIRONMENTAL REQUIREMENTS

Areas to receive resilient flooring shall be maintained at a temperature above 68 degrees F and below 85 degrees F for 2 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. A minimum temperature of 55 degrees F shall be maintained thereafter. Observe ventilation and safety procedures specified in the MSDS. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Resilient flooring application shall be scheduled after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

1.8 EXTRA MATERIALS

Extra flooring material of each color and pattern shall be furnished at the rate of 5 tiles for each 1000 tiles installed. Extra wall base material composed of 20 linear feet of each type, color and pattern shall be furnished. All extra materials shall be packaged in original properly marked containers bearing the manufacturer's name, brand name, pattern color name and number, production run, and handling instructions. Extra materials shall be from the same lot as those installed. Leave extra stock at site in location as directed by Contracting Officer.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE (VCT)

Vinyl-composition tile shall conform to ASTM F 1066, Class 2, (through pattern tile), Composition 1, asbestos-free, and shall be 12 inches square and 1/8 inch thick. Tile shall have the color and pattern uniformly distributed throughout the thickness of the tile.

2.2 WALL BASE

Base shall conform to ASTM F 1861, Type TS (vulcanized thermoset rubber) Base shall be 4 inches high and a minimum 1/8 inch thick. Job formed corners in matching height, shape, and color shall be furnished.

2.3 **DELETED**

2.4 ADHESIVES

Adhesives for flooring, base and accessories shall be as recommended by the manufacturer and comply with local indoor air quality standards.

2.5 SURFACE PREPARATION MATERIALS

Surface preparation materials, such as lining felt, and floor crack fillers shall be as recommended by the flooring manufacturer for the subfloor

conditions.

2.6 POLISH/FINISH

Polish shall be as recommended by the manufacturer and conform to ASTM D 4078.

2.7 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Color, pattern and texture for resilient flooring and accessories shall be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Flooring in any one continuous area or replacement of damaged flooring in continuous area shall be from same production run with same shade and pattern.

PART 3 EXECUTION

3.1 EXAMINATION/VERIFICATION OF CONDITIONS

The Contractor shall examine and verify that site conditions are in agreement with the design package and shall report all conditions that will prevent a proper installation. The Contractor shall not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer.

3.2 SURFACE PREPARATION

Flooring shall be in a smooth, true, level plane, except where indicated as sloped. Floor shall be flat to within 3/16 inch in 10 feet. Subfloor shall be prepared in accordance with flooring manufacturers recommended instructions. The surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) shall be prepared as recommended by the flooring manufacturer. Concrete subfloor preparation shall comply with ASTM F 710. Floor fills or toppings may be required as recommended by the flooring manufacturer. Before any work under this section is begun, all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces shall have been corrected, and all damaged portions of concrete slabs shall have been repaired as recommended by the flooring manufacturer. Concrete curing and sealer compounds, other than the type that does not adversely affect adhesion, shall be entirely removed from the slabs. Paint, varnish, oils, release agents, sealers, waxers, and adhesives shall be removed, as recommended by the flooring manufacturer.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

The suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level shall be determined by moisture and alkalinity tests and shall comply with manufacturers recommendations. Moisture testing shall be in accordance with ASTM F 1869 or ASTM F 2170 unless otherwise recommended by the flooring manufacturer. Alkalinity testing shall be as recommended by the flooring manufacturer. The compatibility of the resilient flooring adhesives to the concrete floors shall be determined by a bond test in accordance with the flooring manufacturers recommendations.

3.4 PLACING VINYL-COMPOSITION TILE

Tile flooring and accessories shall be installed in accordance with

manufacturer's installation instructions. Adhesives shall be prepared and applied in accordance with manufacturer's directions. Tile lines and joints shall be kept square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Edge width shall vary as necessary to maintain full-size tiles in the field, but no edge tile shall be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Edge tile shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied.

3.5 DELETED

3.6 CLEANING

Immediately upon completion of installation of flooring in a room or an area, flooring and adjacent surfaces shall be dry-cleaned to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions. No sooner than 5 days after installation, flooring shall be washed with a nonalkaline cleaning solution, rinsed thoroughly with clear cold water, and, except for rubber flooring and stair treads, risers and stringers, vinyl and other flooring not requiring polish by manufacturer, given the number of coats of polish in accordance with manufacturers written instructions. All other flooring shall be cleaned and maintained as recommended by the manufacturer.

3.7 PROTECTION

From the time of laying until acceptance, flooring shall be protected from damage as recommended by the flooring manufacturer. Flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered shall be removed and replaced.

-- End of Section --

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1.9.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.
- e. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.
- f. Hardware, fittings, and other factory finished items.

1.9.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
 - (1) Exposed piping, conduit, and ductwork;
 - (2) Supports, hangers, air grilles, and registers;
 - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
 - (1) New zinc-coated, aluminum, and copper surfaces under insulation
 - (2) New aluminum jacket on piping
 - (3) New interior ferrous piping under insulation.

1.9.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

- a. **Deleted.**
- b. Piping in Finished Areas: Provide primed surfaces with two coats

of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals throughout the piping systems.

1.9.4 Definitions and Abbreviations

1.9.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.9.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing shall only be accomplished by MPI testing lab.

1.9.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (metals, plastics, wood, paper, leather, cloth, etc.). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.9.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.9.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.9.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.9.4.7 EXT

MPI short term designation for an exterior coating system.

1.9.4.8 INT

MPI short term designation for an interior coating system.

SECTION 11601

LABORATORY FUMEHOODS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-2092S (1998) Industrial Ventilation: A Manual
of Recommended Practice

ASTM INTERNATIONAL (ASTM)

ASTM A 366/A 366M (1997e1) Commercial Steel, Sheet,
Carbon, (0.15 Maximum Percent Cold-Rolled**

ASTM C 1048 (2004) Heat-Treated Flat Glass - Kind HS,
Kind FT Coated and Uncoated Glass

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 45 (2000) Fire Protection for Laboratories
Using Chemicals

NFPA 70 (2005) National Electrical Code

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

Provide final utility connections and utility service to equipment including waste, under Sections 15400 PLUMBING SYSTEMS and 16402 INTERIOR DISTRIBUTION SYSTEM.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Laboratory fume hood layout; G, DO

SD-03 Product Data

Fumehood assembly; G, DO

Include descriptive literature, technical data sheets, and diagrams.

SD-04 Samples

Exterior hood paint; G, DO

SD-06 Test Reports

Fumehood test; G, DO

Base cabinet test; G, DO

SD-08 Manufacturer's Instructions

Fumehood assembly

SD-10 Operation and Maintenance Data

Fumehood assembly, Data Package 2; G, DO

Submit in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

1.4 SUBMITTAL REQUIREMENTS

1.4.1 Hood Paint

Submit color chips of exterior hood paint. Submit all colors which are standard with the manufacturer.

1.4.2 Drawing Requirements

Show pertinent installation layout. Indicate details of construction and rough-in requirements.

1.4.4 Tests

Submit fumehood test and cabinet test reports required by ACGIH-2092S.

PART 2 PRODUCTS

2.1 MATERIALS, COMPONENTS, AND SPECIAL DESIGN REQUIREMENTS

2.1.1 Carbon Steel

ASTM A 366/A 366M, cold rolled sheets, commercial bright finish.

2.1.2 **Deleted**

2.1.3 Safety Glass

ASTM C 1048, fully tempered "FT," clear.

SECTION 15080

THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

ASTM INTERNATIONAL (ASTM)

ASTM A 167	(2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 580/A 580M	(1998; R 2004) Stainless Steel Wire
ASTM B 209	(2004) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 1126	(2004) Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation
ASTM C 1136	(2003a) Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C 1290	(2004) Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts
ASTM C 195	(2000) Mineral Fiber Thermal Insulating Cement
ASTM C 449/C 449M	(2000) Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
ASTM C 534	(2003) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 547	(2003) Mineral Fiber Pipe Insulation
ASTM C 552	(2003) Cellular Glass Thermal Insulation
ASTM C 553	(2002) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 591	(2001) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM C 610	(1999) Molded Expanded Perlite Block and Pipe Thermal Insulation
ASTM C 612	(2004) Mineral Fiber Block and Board Thermal Insulation
ASTM C 647	(1995; R 2000) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C 665	(2001e1) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C 795	(2003) Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C 920	(2002) Elastomeric Joint Sealants
ASTM C 921	(2003a) Jackets for Thermal Insulation
ASTM D 882	(2002) Tensile Properties of Thin Plastic Sheeting
ASTM E 2231	(2002) Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics
ASTM E 84	(2004) Surface Burning Characteristics of Building Materials
ASTM E 96	(2000e1) Water Vapor Transmission of Materials

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-69	(2002) Pipe Hangers and Supports - Selection and Application
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MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds	(1999) National Commercial & Industrial Insulation Standards
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 255	(2000) Method of Test of Surface Burning Characteristics of Building Materials
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U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-3316	(Rev C; Am 2) Adhesives, Fire-Resistant, Thermal Insulation
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UNDERWRITERS LABORATORIES (UL)

UL 723	(2003) Test for Surface Burning
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Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Field-applied insulation and accessories on mechanical systems shall be as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated. Field applied insulation materials required for use on Government-furnished items as listed in the SPECIAL CONTRACT REQUIREMENTS shall be furnished and installed by the Contractor.

1.3 GENERAL QUALITY CONTROL

1.3.1 Standard Products

Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems which are located within, on, under, and adjacent to buildings; and for plumbing systems. Materials shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.3.2 Installer's Qualifications

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.3.3 Surface Burning Characteristics

Unless otherwise specified, insulation shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Flame spread, and smoke developed indexes, shall be determined by ASTM E 84, NFPA 255 or UL 723. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Test specimens shall be prepared and mounted according to ASTM E 2231. Insulation materials located exterior to the building perimeter are not required to be fire rated.

1.3.4 Identification of Materials

Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material. Insulation packages and containers shall be asbestos free.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

Deleted

SD-03 Product Data

General Materials; G, DO
Adhesives; G, DO
Sealants; G, DO
Duct Insulation; G, DO
Duct Insulation Jackets; G, DO
Pipe Insulation Materials; G, DO
Jackets; G, DO

A complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories for each mechanical system requiring insulation shall be included. Materials furnished under this section of the specification shall be submitted at one time.

Deleted

1.5 STORAGE

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means.

1.6 RECYCLED MATERIALS

Provide thermal insulation containing recycled materials to the extent practicable, provided that the materials meets all other requirements of this section. The minimum recycled material content of the following insulation are:

Rock Wool - 75 percent slag of weight
Fiberglass - 20-25 percent glass cullet by weight
Rigid Foam - 9 percent recovered material

PART 2 PRODUCTS

2.1 GENERAL MATERIALS

Insulation material shall conform to Table 1. Insulation thickness shall be as listed in Table 2. Insulation exterior shall be cleanable, grease resistant, non-flaking and non-peeling. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall be asbestos free and conform to the following:

2.1.1 Adhesives

2.1.1.1 Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C 195.

2.1.1.2 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. Lagging adhesives shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Adhesive shall be MIL-A-3316, Class 1, pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding fibrous glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation.

2.1.2 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprane based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The dried adhesive shall be nonflammable and fire resistant. Natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation shall be used to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern must remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

2.1.3 Caulking

ASTM C 920, Type S, Grade NS, Class 25, Use A.

2.1.4 Corner Angles

Nominal 0.016 inch aluminum 1 x 1 inch with factory applied kraft backing. Aluminum shall be ASTM B 209, Alloy 3003, 3105, or 5005.

2.1.5 Finishing Cement

ASTM C 449/C 449M: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with ASTM C 795.

2.1.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20X20 maximum mesh size, and glass tape shall have maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Tape shall be 4 inch wide rolls. Class 3 tape shall be 4.5 ounces/square yard.

2.1.7 Staples

Outward clinching type ASTM A 167, Type 304 or 316 stainless steel.

2.1.8 Jackets

2.1.8.1 Aluminum Jackets

Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; ASTM B 209, Temper H14, Temper H16, Alloy 3003, 5005, or 3105 with factory applied moisture retarder. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch and larger diameter. Aluminum jacket circumferential seam bands shall be 2 x 0.016 inch aluminum matching jacket material. Bands for insulation below ground shall be 3/4 x 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place.

2.1.8.2 Polyvinyl Chloride (PVC) Jackets

Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, UV resistant rating or treatment and moderate chemical resistance with minimum thickness 0.030 inch.

2.1.9 Vapor Retarder Required

ASTM C 921, Type I, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork, where a minimum puncture resistance of 25 Beach units is acceptable. Minimum tensile strength, 35 pounds/inch width. ASTM C 921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 20 pounds/inch width. Jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing. Based on the application, insulation materials that require factory applied jackets are mineral fiber, cellular glass, polyisocyanurate, and phenolic foam. Insulation materials that do not require jacketing are flexible elastomerics. All non-metallic jackets shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

2.1.9.1 White Vapor Retarder All Service Jacket (ASJ)

Standard reinforced fire retardant jacket for use on hot/cold pipes, ducts, or equipment. Vapor retarder jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing.

2.1.9.2 Vapor Retarder Mastic Coatings

The vapor retarder coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall be determined according to procedure B of ASTM E 96 utilizing apparatus described in ASTM E 96. The coating shall be a nonflammable, fire resistant type. All other application and service properties shall be in accordance with ASTM C 647.

2.1.9.3 Laminated Film Vapor Retarder

ASTM C 1136, Type I, maximum moisture vapor transmission 0.02 perms, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork, where Type II, maximum moisture vapor transmission 0.02 perms, a minimum puncture resistance of 25 Beach units is acceptable. Vapor retarder shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

2.1.9.4 Polyvinylidene Chloride (PVDC) Film Vapor Retarder

The PVDC film vapor retarder shall have a maximum moisture vapor transmission of 0.02 perms, minimum puncture resistance of 150 Beach units, a minimum tensile strength in any direction of 30 lb/inch when tested per ASTM D 882, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

2.1.9.5 Polyvinylidene Chloride Vapor Retarder Adhesive Tape

Requirements must meet the same as specified for Laminated Film Vapor Retarder above.

2.1.10 Vapor Retarder Not Required

ASTM C 921, Type II, Class D, minimum puncture resistance 50 Beach units on all surfaces except ductwork, where Type IV, maximum moisture vapor transmission 0.10, a minimum puncture resistance of 25 Beach units is acceptable. Jacket shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

2.1.11 Wire

Soft annealed ASTM A 580/A 580M Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

2.1.12 Insulation Bands

Insulation bands shall be 1/2 inch wide; 26 gauge stainless steel.

2.1.13 Sealants

Sealants shall be chosen from the butyl polymer type, the styrene-butadiene rubber type, or the butyl type of sealants. Sealants shall have a maximum moisture vapor transmission of 0.02 perms, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

2.2 PIPE INSULATION MATERIALS

The Contractor shall comply with EPA requirements in accordance with Section 01670 RECYCLED / RECOVERED MATERIALS. Pipe insulation materials shall be limited to those listed herein and shall meet the following requirements:

2.2.1 Cold Pipeline (-30 to 60 degrees F)

Insulation for outdoor, indoor, exposed or concealed applications, shall be as follows:

- a. Cellular Glass: ASTM C 552, Type II, and Type III. Supply the insulation with manufacturer's recommended factory-applied jacket.
- b. Flexible Elastomeric Cellular Insulation: ASTM C 534, Grade 1, Type I or II. Type II shall have vapor retarder skin on one or both sides of the insulation.
- c. Phenolic Insulation: ASTM C 1126, Type III. Phenolic insulations shall comply with ASTM C 795 and with the ASTM C 665 paragraph Corrosiveness. Supply the insulation with manufacturer's recommended factory-applied jacket.
- d. Polyisocyanurate Insulation: ASTM C 591, type I. Supply the insulation with manufacturer's recommended factory-applied vapor retarder.

2.2.2 Hot Pipeline (Above 60 degrees F)

Insulation for outdoor, indoor, exposed or concealed applications shall meet the following requirements. Supply the insulation with manufacturer's recommended factory-applied jacket.

- a. Mineral Fiber: ASTM C 547, Types I, II or III, supply the insulation with manufacturer's recommended factory-applied jacket.
- c. Cellular Glass: ASTM C 552, Type II and Type III. Supply the insulation with manufacturer's recommended factory-applied jacket.
- d. Flexible Elastomeric Cellular Insulation: ASTM C 534, Grade 1, Type I or II to 200 degrees F service.
- e. Phenolic Insulation: ASTM C 1126 Type III to 250 F service shall comply with ASTM C 795. Supply the insulation with manufacturer's recommended factory-applied jacket.
- f. Perlite Insulation: ASTM C 610
- g. Polyisocyanurate Insulation: ASTM C 591, Type 1, to 300 degrees F service. Supply the insulation with manufacturer's recommended factory applied jacket.

2.3 DUCT SYSTEMS INSULATION

2.3.1 Duct Insulation

Provide factory-applied insulation with insulation manufacturer's standard reinforced fire-retardant vapor barrier.

2.3.1.1 Rigid Insulation

Rigid mineral fiber in accordance with ASTM C 612, Class 2 (maximum surface temperature 400 degrees F), 3 pcf average, one inch thick, Type IA, IB, II, III, and IV.

2.3.1.2 Blanket Insulation

Blanket flexible mineral fiber insulation conforming to ASTM C 553, Type 1, Class B-3, 3/4 pcf nominal, 2.0 inches thick or Type II up to 250 degrees F. Also ASTM C 1290 Type III may be used.

2.3.2 Duct Insulation Jackets

2.3.2.1 All-Purpose Jacket

Provide insulation with insulation manufacturer's standard reinforced fire-retardant jacket with or without integral vapor barrier as required by the service.

2.3.2.2 Deleted

2.4 EQUIPMENT INSULATION MATERIALS

Insulate equipment and accessories as specified in Tables 4 and 5. In outside locations, provide insulation 1/2 inch thicker than specified. Increase the specified insulation thickness for equipment where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Insulation shall only be applied to unheated and uncooled piping and equipment. Flexible elastomeric cellular insulation shall not be compressed at joists, studs, columns, ducts, hangers, etc. The insulation shall not pull apart after a one hour period; any insulation found to pull apart after one hour, shall be replaced.

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the jobsite. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA Insulation Stds plates except where modified herein or on the drawings.

3.1.2 Firestopping

Where pipes and ducts pass through fire walls and fire partitions, the penetration shall be sealed with fire stopping materials as specified in Section 07840 FIRESTOPPING.

3.1.3 Deleted

3.1.4 Installation of Flexible Elastomeric Cellular Insulation

Flexible elastomeric cellular insulation shall be installed with seams and

joints sealed with rubberized contact adhesive. Insulation with pre-applied adhesive is not permitted. Flexible elastomeric cellular insulation shall not be used on surfaces greater than 200 degrees F. Seams shall be staggered when applying multiple layers of insulation. Insulation exposed to weather and not shown to have jacketing shall be protected with two coats of UV resistant finish or PVC or metal jacketing as recommended by the manufacturer after the adhesive is dry and cured. A brush coating of adhesive shall be applied to both butt ends to be joined and to both slit surfaces to be sealed. The adhesive shall be allowed to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one hour after application. Insulation that can be pulled apart one hour after installation shall be replaced.

3.1.5 Welding

No welding shall be done on piping, duct or equipment without written approval of the Contracting Officer. The capacitor discharge welding process may be used for securing metal fasteners to duct.

3.1.6 Pipes/Ducts/Equipment which Require Insulation

Insulation is required on all pipes, ducts, or equipment, except for omitted items, as specified.

3.2 PIPE INSULATION INSTALLATION

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used. Pipe insulation shall be omitted on the following:

- a. Pipe used solely for fire protection.
- b. Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped shall have the hot water supply and drain, including the trap, insulated where exposed.
- c. Sanitary drain lines.
- d. Air chambers.
- e. Adjacent insulation.
- f. ASME stamps.
- g. Access plates of fan housings.
- h. Cleanouts or handholes.
- i. Components within factory preinsulated HVAC equipment.
- j. Factory preinsulated flexible ductwork.

- k. Factory preinsulated HVAC equipment.
- l. Manufacturer's nameplates.
- m. Vibration isolating connections.

3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors

- a. Pipe insulation shall be continuous through the sleeve.
- b. An aluminum jacket with factory applied moisture retarder shall be provided over the insulation wherever penetrations require sealing.
- c. Where pipes penetrate interior walls, the aluminum jacket shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.
- d. Where penetrating floors, the aluminum jacket shall extend from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.
- e. Where penetrating roofs, pipe shall be insulated as required for interior service to a point flush with the top of the flashing and sealed with vapor retarder coating. The insulation for exterior application shall butt tightly to the top of flashing and interior insulation. The exterior aluminum jacket shall extend 2 inches down beyond the end of the insulation to form a counter flashing. The flashing and counter flashing shall be sealed underneath with caulking.
- f. For hot water pipes supplying lavatories or other similar heated service that requires insulation, the insulation shall be terminated on the backside of the finished wall. The insulation termination shall be protected with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch applied with glass tape embedded between coats (if applicable). The coating shall extend out onto the insulation 2 inches and shall seal the end of the insulation. Glass tape seams shall overlap 1 inch. The annular space between the pipe and wall penetration shall be caulked with approved fire stop material. The pipe and wall penetration shall be covered with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration at least 3/8 inches.
- g. For domestic cold water pipes supplying lavatories or other similar cooling service that requires insulation, the insulation shall be terminated on the finished side of the wall (i.e., insulation must cover the pipe throughout the wall penetration). The insulation shall be protected with two coats of vapor barrier coating with a minimum total thickness of 1/16 inch. The coating shall extend out onto the insulation 2 inches and shall seal the end of the insulation. The annular space between the outer surface of the pipe insulation and the wall penetration shall be caulked with an approved fire stop material having vapor retarder properties. The pipe and wall penetration shall be covered with a properly sized (well fitting) escutcheon plate. The escutcheon plate shall overlap the wall penetration by at least 3/8 inches.

3.2.1.3 Pipes Passing Through Hangers

- a. Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-69. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed.
- b. Horizontal pipes larger than 2 inches at 60 degrees F and above shall be supported on hangers in accordance with MSS SP-69, and Section 15400 PLUMBING, GENERAL PURPOSE.
- c. Horizontal pipes larger than 2 inches and below 60 degrees F shall be supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-69. An insulation insert of cellular glass, calcium silicate (or perlite above 80 F), or the necessary strength polyisocyanurate shall be installed above each shield. The insert shall cover not less than the bottom 180-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.
- d. Vertical pipes shall be supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-69 covering the 360-degree arc of the insulation. An insulation insert of cellular glass shall be installed between each shield and the pipe. The insert shall cover the 360-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported with hangers in the vertical run of the pipe that are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.
- e. Inserts shall be covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, shall overlap the adjoining pipe jacket 1-1/2 inches, and shall be sealed as required for the pipe jacket. The jacket material used to cover inserts in flexible elastomeric cellular insulation shall

conform to ASTM C 1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Elastomeric Cellular Pipe Insulation

Flexible elastomeric cellular pipe insulation shall be tubular form for pipe sizes 6 inches and less. Grade 1, Type II sheet insulation used on pipes larger than 6 inches shall not be stretched around the pipe. Seams shall be staggered when applying multiple layers of insulation. Sweat fittings shall be insulated with miter-cut pieces the same size as on adjacent piping. Screwed fittings shall be insulated with sleeved fitting covers fabricated from miter-cut pieces and shall be overlapped and sealed to the adjacent pipe insulation.

3.2.1.5 Deleted

3.2.1.6 Pipe Insulation Material and Thickness

TABLE 1
Insulation Material For Piping (°F)

Service	Material	Spec.	Type	Class	Vapor Retarder Required
Heating Hot Water Supply & Return (Max 250°F)	Mineral Fiber	ASTM C 547	I	1	No
	Cellular Glass	ASTM C 552	II	2	No
	Faced Phenol Foam	ASTM C 1126	III		Yes
	Perlite	ASTM C 610			No
	Polyisocyanurate	ASTM C 591	I		No
Cold Domestic Water Piping,	Polyisocyanurate	ASTM C 591	I		Yes
	Cellular Glass	ASTM C 552	II	2	No
	Flex Elast Cell'r	ASTM C 534	I		No
	Faced Phenol Foam	ASTM C 1126	III		Yes
Hot Domestic Water Supply & Recirculating Piping (Max. 200°F)	Mineral Fiber	ASTM C 547	I	1	No
	Cellular Glass	ASTM C 552	II	2	No
	Flex Elast Cell'r	ASTM C 534	I		No
	Faced Phenol Foam	ASTM C 1126	III		Yes
	Polyisocyanurate	ASTM C 591	I		No
Deleted					
Exposed Lav'r'y Drains, Exposed Domestic Water Piping & Drains to Areas for Handicap Personnel	Flex Elast Cell'r	ASTM C 534	I		No
A/C condensate Drain Located Inside Bldg.	Polyisocyanurate	ASTM C 591	I		Yes
	Cellular Glass	ASTM C 552	II	2	No
	Flex Elast Cell'r	ASTM C 534	I		No

TABLE 1
Insulation Material For Piping (°F)

Service	Material	Spec.	Type	Class	Vapor Retarder Required
	Faced Phenol Foam	ASTM C 1126	II		Yes

TABLE 2
Piping Insulation Thickness (inch and °F)

Service	Material	Tube And Pipe Size (Inches)						
		<1	1- <1.5	1.5- <4	4- <8	>or = to 8		
Heating Hot Water Supply & Return, (Max. 250°F)	Mineral Fiber	1.5	1.5	2	2	2		
	Cellular Glass	1.5	1.5	1.5	1.5	1.5		
	Perlite	2.5	2.5	3	3	3		
Cold Domestic Water Piping, Makeup Water, &	Cellular Glass	1.5	1.5	1.5	1.5	1.5		
	Flex Elas Cell'r	1	1	1	N/A	N/A		
	Faced Phenolic Foam	1	1	1	1	1		
Hot Domestic Water Supply and Recirculating Piping (Max 200°F)	Mineral Fiber	1	1	1	1.5	1.5		
	Cellular Glass	1.5	1.5	1.5	1.5	1.5		
	Flex Elas Cell'r	1	1	1	N/A	N/A		
Deleted								
Exposed Lavatory Drains, Exposed Domestic Water Piping & Drains to Areas for Handicap Personnel	Flex Elas Cell'r	0.5	0.5	0.5	0.5	0.5		
A/C condensate Drain Located Inside Bldg.	Cellular Glass	1.5	1.5	1.5	1.5	1.5		
	Flex Elas Cell'r	1	1	1	N/A	N/A		
	Faced Phenol Foam	1	1	1	1	1		

3.2.2 Aboveground Cold Pipelines

The following cold pipelines for minus 30 to plus 60 degrees F, shall be insulated per Table 2 except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted. This includes but is not limited to the following:

- a. Domestic cold and chilled drinking water.

- b. Air conditioner condensate drains.
- c. Exposed lavatory drains and domestic water lines serving plumbing fixtures for handicap persons.

3.2.2.1 Insulation Material and Thickness

Insulation thickness for cold pipelines shall be determined using Table 2.

3.2.2.2 Jacket for Mineral Fiber, Cellular Glass, Phenolic Foam, and Polyisocyanurate Foam Insulated Pipe

Insulation shall be covered with a factory applied vapor retarder jacket or field applied seal welded PVC jacket. Insulation inside the building, to be protected with an aluminum jacket, shall have the insulation and vapor retarder jacket installed as specified herein. The aluminum jacket shall be installed as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required. In high abuse areas such as janitor closets and traffic areas in equipment rooms, kitchens, and mechanical rooms, aluminum jackets shall be provided for pipe insulation to the 6 ft level.

3.2.2.3 Installing Insulation for Straight Runs Hot and Cold Pipe

- a. Insulation shall be applied to the pipe with joints tightly butted. All butted joints and ends shall be sealed with joint sealant and sealed with a vapor retarder coating or PVDC adhesive tape.
- b. Longitudinal laps of the jacket material shall overlap not less than 1-1/2 inches. Butt strips 3 inches wide shall be provided for circumferential joints.
- c. Laps and butt strips shall be secured with adhesive and stapled on 4 inch centers if not factory self-sealing. If staples are used, they shall be sealed per item "e." below. Note that staples are not required with cellular glass systems.
- d. Factory self-sealing lap systems may be used when the ambient temperature is between 40 and 120 degrees F during installation. The lap system shall be installed in accordance with manufacturer's recommendations. Stapler shall be used only if specifically recommended by the manufacturer. Where gaps occur, the section shall be replaced or the gap repaired by applying adhesive under the lap and then stapling.
- e. All Staples, including those used to repair factory self-seal lap systems, shall be coated with a vapor retarder coating or PVDC adhesive tape. All seams, except those on factory self-seal systems shall be coated with vapor retarder coating or PVDC adhesive tape.
- f. Breaks and punctures in the jacket material shall be patched by wrapping a strip of jacket material around the pipe and securing it with adhesive, stapling, and coating with vapor retarder coating or PVDC adhesive tape. The patch shall extend not less than 1-1/2 inches past the break.

- g. At penetrations such as thermometers, the voids in the insulation shall be filled and sealed with vapor retarder coating or PVDC adhesive tape.
- h. Installation of flexible elastomeric cellular pipe insulation shall be by slitting the tubular sections and applying them onto the piping or tubing. Alternately, whenever possible slide un-slit sections over the open ends of piping or tubing. All seams and butt joints shall be secured and sealed with adhesive. When using self seal products only the butt joints shall be secured with adhesive. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams and joints. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives shall be used. Grade 1, Type II sheet insulation when used on pipe larger than 6 inches shall not be stretched around the pipe. On pipes larger than 12 inches, adhere sheet insulation directly to the pipe on the lower 1/3 of the pipe.

3.2.2.4 Insulation for Fittings and Accessories

- a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be sealed with joint sealant and sealed with a vapor retarder coating or PVDC adhesive tape.
- b. Precut or preformed insulation shall be placed around all fittings and accessories and shall conform to MICA plates except as modified herein: 5 for anchors; 10, 11, and 13 for fittings; 14 for valves; and 17 for flanges and unions. Insulation shall be the same insulation as the pipe insulation, including same density, thickness, and thermal conductivity. Where precut/preformed is unavailable, rigid preformed pipe insulation sections may be segmented into the shape required. Insulation of the same thickness and conductivity as the adjoining pipe insulation shall be used. If nesting size insulation is used, the insulation shall be overlapped 2 inches or one pipe diameter. Elbows insulated using segments shall conform to MICA Tables 12.20 "Mitered Insulation Elbow".
- c. Upon completion of insulation installation on flanges, unions, valves, anchors, fittings and accessories, terminations, seams, joints and insulation not protected by factory vapor retarder jackets or PVC fitting covers shall be protected with PVDC adhesive tape or two coats of vapor retarder coating with a minimum total thickness of 1/16 inch, applied with glass tape embedded between coats. Tape seams shall overlap 1 inch. The coating shall extend out onto the adjoining pipe insulation 2 inches. Fabricated insulation with a factory vapor retarder jacket shall be protected with PVDC adhesive tape or two coats of vapor retarder coating with a minimum thickness of 1/16 inch and with a 2 inch wide glass tape embedded between coats. Where fitting insulation butts to pipe insulation, the joints shall be sealed with a vapor retarder coating and a 4 inch wide ASJ tape which matches the jacket of the pipe insulation.
- d. Anchors attached directly to the pipe shall be insulated for a sufficient distance to prevent condensation but not less than 6 inches from the insulation surface.

- e. Insulation shall be marked showing the location of unions, strainers, and check valves.

3.2.2.5 Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut or premolded insulation segments shall be used under the fitting covers for elbows. Insulation segments shall be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. The covers shall be secured by PVC vapor retarder tape, adhesive, seal welding or with tacks made for securing PVC covers. Seams in the cover, and tacks and laps to adjoining pipe insulation jacket, shall be sealed with vapor retarder tape to ensure that the assembly has a continuous vapor seal.

3.2.3 Hot Pipelines

All hot pipe lines above 60 degrees F, except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted, shall be insulated per Table 2. This includes but is not limited to the following:

- a. Domestic hot water supply & re-circulating system.
- b. compressed air discharge.
- c. Hot water heating.

Insulation shall be covered, in accordance with manufacturer's recommendations, with a factory applied Type II jacket or field applied aluminum where required or seal welded PVC.

3.2.4 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed as specified for the applicable service inside the building. After this procedure, an aluminum jacket or PVC jacket shall be applied. PVC jacketing requires no factory-applied jacket beneath it, however an all service jacket shall be applied if factory applied jacketing is not furnished. Flexible elastomeric cellular insulation exposed to weather shall be treated in accordance with paragraph INSTALLATION OF FLEXIBLE ELASTOMERIC CELLULAR INSULATION in PART 3.

3.2.4.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 2 inches at longitudinal and circumferential joints and shall be secured with bands at not more than 12 inch centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o'clock positions. Joints on piping 60 degrees F and below shall be sealed with caulking while overlapping to prevent moisture penetration. Where jacketing on piping 60 degrees F and below abuts an un-insulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 60 degrees F shall be sealed with a moisture retarder.

3.2.4.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and

finished as specified for the applicable service. Two coats of breather emulsion type weatherproof mastic (impermeable to water, permeable to air) recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be provided when PVC jackets are used for straight runs of pipe. PVC fitting covers shall have adhesive welded joints and shall be weatherproof.

3.2.4.3 PVC Jacket

PVC jacket shall be ultraviolet resistant and adhesive welded weather tight with manufacturer's recommended adhesive. Installation shall include provision for thermal expansion.

3.3 DUCTWORK, PLENUMS, CASINGS, AND ACCESSORIES INSULATION INSTALLATION

Corner angles shall be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Duct insulation shall be omitted on exposed supply and return ducts in air conditioned spaces where the difference between supply air temperature and room air temperature is less than 15 degrees F unless otherwise shown. Air conditioned spaces shall be defined as those spaces directly supplied with cooled conditioned air (or provided with a cooling device such as a fan-coil unit) and heated conditioned air (or provided with a heating device such as a unit heater, radiator or convector).

3.3.1 Duct Insulation Thickness

Duct insulation thickness shall be in accordance with Table 4.

Table 4 - Minimum Duct Insulation (inches)

Cold Air Ducts	1.5
Relief Ducts	1.5
Fresh Air Intake Ducts	1.5
Warm Air Ducts	1.5
Relief Ducts	1.5
Fresh Air Intake Ducts	1.5

3.3.2 Insulation and Vapor Retarder for Air Duct

Insulation and vapor retarder shall be provided for the following cold air ducts and associated equipment.

- a. Supply ducts.
- b. **Deleted.**
- c. **Deleted.**
- d. Flexible run-outs (field-insulated).
- e. Duct-mounted coil casings.

- f. Filter boxes.
- g. Site-erected air conditioner casings.
- h. Ducts exposed to weather.

Insulation for rectangular ducts shall be flexible type where concealed, minimum density 3/4 pcf, and rigid type where exposed, minimum density 3 pcf.

Insulation for both concealed or exposed round/oval ducts shall be flexible type, minimum density 3/4 pcf or a semi rigid board, minimum density 3 pcf, formed or fabricated to a tight fit, edges beveled and joints tightly butted and staggered. Insulation for all exposed ducts shall be provided with either a white, paint-able, factory-applied Type I jacket or a field applied vapor retarder jacket coating finish as specified, the total field applied dry film thickness shall be approximately 1/16 inch. Insulation on all concealed duct shall be provided with a factory-applied Type I or II vapor retarder jacket. Duct insulation shall be continuous through sleeves and prepared openings except firewall penetrations. Duct insulation terminating at fire dampers, shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder shall cover the collar, neck, and any un-insulated surfaces of diffusers, registers and grills. Vapor retarder materials shall be applied to form a complete unbroken vapor seal over the insulation. Sheet Metal Duct shall be sealed in accordance with Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

3.3.2.1 Installation on Concealed Duct

- a. For rectangular, oval or round ducts, flexible insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.
- b. For rectangular and oval ducts, 24 inches and larger insulation shall be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.
- c. For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.
- d. Insulation shall be impaled on the mechanical fasteners (self stick pins) where used and shall be pressed thoroughly into the adhesive. Care shall be taken to ensure vapor retarder jacket joints overlap 2 inches. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type duct hangers.
- e. Self-locking washers shall be installed where mechanical fasteners are used. The pin shall be trimmed back and bent over.
- f. Jacket overlaps shall be secured with staples and tape as necessary to ensure a secure seal. Staples, tape and seams shall be coated with a brush coat of vapor retarder coating or PVDC adhesive tape.

- g. Breaks in the jacket material shall be covered with patches of the same material as the vapor retarder jacket. The patches shall extend not less than 2 inches beyond the break or penetration in all directions and shall be secured with tape and staples. Staples and tape joints shall be sealed with a brush coat of vapor retarder coating or PVDC adhesive tape.
- h. At jacket penetrations such as hangers, thermometers, and damper operating rods, voids in the insulation shall be filled and the penetration sealed with a brush coat of vapor retarder coating or PVDC adhesive tape.
- i. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish or tape with a brush coat of vapor retarder coating.. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.
- j. Where insulation standoff brackets occur, insulation shall be extended under the bracket and the jacket terminated at the bracket.

3.3.2.2 Installation on Exposed Duct Work

- a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches. Mechanical fasteners shall be as corrosion resistant as G60 coated galvanized steel, and shall indefinitely sustain a 50 lb tensile dead load test perpendicular to the duct wall.
- b. Duct insulation shall be formed with minimum jacket seams. Each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors.
- c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and the pin trimmed or bent over.
- d. Joints in the insulation jacket shall be sealed with a 4 inch wide strip of tape. Tape seams shall be sealed with a brush coat of vapor retarder coating.
- e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor

retarder coating.

- f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a brush coat of vapor retarder coating.
- g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.
- h. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf, attached as per MICA standards.

3.3.3 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket shall be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

3.4 DELETED

-- End of Section --

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SECTION 15185

LOW TEMPERATURE WATER HEATING SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.18 (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings

ANSI B16.24 (1991; Errata 1991) Cast Copper Alloy Pipe Flanges and Flanged Fittings Class 150, 300, 400, 600, 900, 1500, and 2500

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1017 (2003) Temperature Actuated Mixing Valves for Hot Water Distribution Systems

AMERICAN WELDING SOCIETY (AWS)

AWS Z49.1 (1999) Safety in Welding, Cutting and Allied Processes

ASME INTERNATIONAL (ASME)

ASME B1.1 (2001; R 2003) Unified Inch Screw Threads (UN and UNR Thread Form)

ASME B1.20.1 (1983; R 2001) Pipe Threads, General Purpose, Inch

ASME B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings

ASME B16.11 (2002) Forged Fittings, Socket-Welding and Threaded

ASME B16.21 (1992) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.22 (2002) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

ASME B16.3 (1998) Malleable Iron Threaded Fittings

ASME B16.34 (1996) Valves Flanged, Threaded, and Welding End

ASME B16.39 (1998) Malleable Iron Threaded Pipe Unions

ASME B16.5	(2003) Pipe Flanges and Flanged Fittings
ASME B16.9	(2003) Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.2	(1987; R 1999) Square and Hex Nuts
ASME B31.9	(1996) Building Services Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

ASTM INTERNATIONAL (ASTM)

ASTM A 194/A 194M	(2004a) Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service or Both
ASTM A 307	(2004) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 53/A 53M	(2004a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM B 32	(2004) Solder Metal
ASTM B 88	(2003) Seamless Copper Water Tube
ASTM D 1785	(2004a) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM F 1120	(1987; R 2004) Circular Metallic Bellows Type Expansion Joints for Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA A4015	(1994; R 1995) Copper Tube Handbook
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-110	(1996) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
MSS SP-58	(2002) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(2002) Pipe Hangers and Supports - Selection and Application
MSS SP-70	(1998) Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-72	(1999) Ball Valves with Flanged or Butt-Welding Ends for General Service

MSS SP-80 (2003) Bronze Gate, Globe, Angle and Check
Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2 (2000) Industrial Controls and Systems:
Controllers, Contactors, and Overload
Relays Rated Not More than 2000 Volts AC
or 750 Volts DC

NEMA ICS 6 (1993; R 2001) Industrial Control and
Systems: Enclosures

NEMA MG 1 (2003) Motors and Generators

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-1689 (Rev B) Tape, Pressure-Sensitive Adhesive,
(Plastic Film)

FS A-A-50560 (Basic) Pumps, Centrifugal, Water
Circulating, Electric-Motor-Driven

FS WW-S-2739 (Basic) Strainers, Sediment: Pipeline,
Water, Air, Gas, Oil, or Steam

FS WW-U-516 (Rev B, Notice 1) Unions, Brass or Bronze,
Threaded Pipe Connections and Solder-Joint
Tube Connections

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.144 Safety Color Code for Marking Physical
Hazards

29 CFR 1910.219 Mechanical Power Transmission Apparatus

1.2 SYSTEM DESCRIPTION

Except as specified otherwise, equipment and piping components shall be suitable for use in low temperature water heating system. Except as modified herein, the pressure temperature limitations shall be as specified in the referenced standards and specifications. Pressures in this specification are pressures in pounds per square inch above atmospheric pressure, and temperatures are in degrees Fahrenheit (F).

1.2.1 Hot Water Heating System

Submit plan, elevations, dimensions, capacities, and ratings. Include the following:

- a. Unit heaters
- b. Convectors
- c. Pumps
- d. Valves

- e. Flow measuring equipment
- f. Backflow preventer

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Hot water heating system

SD-03 Product Data

Pumps; G,DO.

Include pump speed and characteristic curve for performance of impeller selected for each pump. Curves shall indicate capacity vs head, efficiency, and brake power for full range, from shut-off to free delivery.

Flow measuring equipment

Backflow preventers

Hot water heating pipe; G,DO.

SD-06 Test Reports

Hydrostatic test of piping system

Auxiliary equipment and accessory tests

Submit test reports in accordance with the paragraph entitled "Field Quality Control."

SD-07 Certificates

Deleted

Report of prior installations

Welding procedures

Welder's qualifications

SD-10 Operation and Maintenance Data

Submit in accordance with Section 01781 OPERATION AND MAINTENANCE DATA. Submit a list of qualified service organizations which includes addresses and qualifications.

1.4 QUALITY ASSURANCE

1.4.1 Standard Commercial Product for Terminal Units

Terminal units provided shall comply with features called out in this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the terminal units being furnished. A standard commercial product is a product which has been sold or is currently being offered for sale, on the commercial market through advertisements or manufacturer's catalogs, or brochures. Provide Institute of Boiler and Radiator Manufacturer (IBR) or Steel Boiler Institute (SBI) rating for required capacity.

1.4.2 Welding

1.4.2.1 Report of Prior Installations

Submit a Certificate of Full Approval or a current Certificate of Approval for each design, size, and make of backflow preventer being provided for the project. Certificate shall be from the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, and shall attest that this design, size, and make of backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. A Certificate of Provisional Approval is not acceptable in lieu of the above.

1.4.2.2 Welding Procedures

Before performing welding, submit three copies of welding procedure specification for all metals to be used in the work, together with proof of welder's qualification as outlines in ASME B31.9.

1.4.2.3 Welder's Qualifications

Before welder or operator performs welding, submit three copies of Welder's Performance Qualification Record in conformance with ASME B31.9 showing that the welder was tested under the approved procedure specification submitted by the Contractor. In addition, submit each welder's assigned number, letter, or symbol used to identify the work of the welder.

1.4.2.4 Identification of Welder's Work

Ensure that each welder's assigned number, letter or symbol is affixed immediately upon completion of the weld. To welders making defective welds after passing a qualification test, give a requalification test. Upon failing to pass the test, do not permit welder to work in this contract.

1.4.2.5 Previous Qualifications

Welding procedures, welders, and welding operators previously qualified by test may be accepted for this contract without requalification subject to the approval and provided that all the conditions specified in ASME B31.9 are met before a procedure can be used.

1.4.3 Brazing and Soldering

1.4.3.1 Brazing Procedure

ASME B31.9. Brazing procedure for joints shall be as outlined in CDA A4015.

1.4.3.2 Soldering, Soldering Preparation, and Procedures for Joints

ASME B31.9 and as outlined in CDA A4015.

1.4.4 **Deleted**

1.5 SAFETY STANDARDS

1.5.1 Welding

Safety in welding and cutting of pipe shall conform to AWS Z49.1.

1.5.2 Guards

Couplings, motor shafts, gears and other moving parts shall be guarded, in accordance with OSHA 29 CFR 1910.219. Guards shall be cast iron or expanded metal. Guard parts shall be rigid and removable without disassembling the guarded unit.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

2.1.1 Hot Water Heating Pipe (Supply and Return)

ASTM A 53/A 53M electric resistance welded or seamless Schedule 40 steel pipe or ASTM B 88 Type K hard drawn Copper tubing.

2.1.2 Fittings

Provide fittings compatible with the pipe being provided and shall conform to the following requirements.

2.1.2.1 Steel or Malleable Iron Pipe

Sizes 1/8 to 2 inches. ASME B16.11 steel socket welding or screwed type or ASME B16.3 for screwed type malleable iron fittings.

2.1.2.2 Steel, Cast Iron, or Bronze

Sizes 2 1/2 inches and above. Steel fitting butt welding type ASME B16.9 or ASME B16.5 flanged type. Cast iron fittings flanged type ASME B16.1. Bronze fittings up to 8 inch size flanged type ANSI B16.24.

2.1.2.3 Fittings for Copper Tubing

ANSI B16.18 cast bronze solder joint type or ASME B16.22 wrought copper solder joint type. Fittings may be flared or compression joint type.

2.1.3 Unions

2.1.3.1 Steel Pipe

Provide ASME B16.39, malleable iron unions, threaded connections.

2.1.3.2 Copper Tubing

Provide FS WW-U-516, bronze unions, solder joint end.

2.1.3.3 Dielectric Union

Provide insulated union with galvanized steel female pipe-threaded end and a copper solder joint end conforming with ASME B16.39, Class 1, dimensional, strength and pressure requirements. Union shall have a water-impervious insulation barrier capable of limiting galvanic current to one percent of the short-circuit current in a corresponding bimetallic joint. When dry, insulation barrier shall be able to withstand a 600-volt breakdown test.

2.1.4 Flanges

Remove raised faces when used with flanges having a flat face.

2.1.4.1 Steel Flanges

ASME B16.5 forged steel, welding type.

2.1.4.2 Cast Iron Screwed Flanges

ASME B16.1.

2.1.4.3 Bronze Screwed Flanges

ANSI B16.24.

2.1.5 Drains and Overflows

2.1.5.1 Steel Pipe

ASTM A 53/A 53M, Electric resistance welded Schedule 40, Malleable iron or forged steel fittings, screwed or welded joints.

2.1.5.2 Copper Tubing

ASTM B 88, Type L hard drawn, cast brass or wrought copper fittings, Grade Sb5 solder joints.

2.1.5.3 PVC Pipe

ASTM D 1785, Schedule 40 solvent weld joints.

2.1.6 Valves

Valves shall have rising stems and shall open when turned counterclockwise.

2.1.6.1 Gate Valves

- a. Bronze Gate Valves: MSS SP-80, 2 inches and smaller, wedge disc,

inside screw type not less than Class 150. Use solder joint ends with copper tubing.

- b. Steel Gate Valves: ASME B16.34, provide with open stem and yoke type with solid wedge or flexible wedge disc and heat and corrosion-resistant steel trim.
- c. Cast Iron Gate Valves: MSS SP-70, 2 1/2 inches and larger, open stem and yoke type with bronze trim.

2.1.6.2 Globe and Angle Valves

- a. Bronze Globe and Angle Valves: MSS SP-80, 2 inches and smaller, Class 200, except use Class 150 with solder ends for copper tubing. Valves shall have renewable seat and discs except solder end valves which shall have integral seats.
- b. Steel Globe and Angle Valves: ASME B16.34, provide with heat and corrosion-resistant trim.

2.1.6.3 Check Valves

- a. Bronze Check Valves: MSS SP-80, 2 inches and smaller, regrinding swing check type, Class 200.
- b. Steel Swing Check Valves: ASME B16.34, regrinding swing check type, Class 200.
 - (1) Swing check valves shall have bolted caps.
 - (2) Steel Lift check valves 2 inches and smaller shall have bolted caps. Lift check valves 2 1/2 inches and larger shall have pressure seal caps.
- c. Cast Iron Check Valves: ASME B16.34, 2 1/2 inches and larger, bronze trim, non-slam, eccentric disc type for centrifugal pump discharge service.

2.1.6.4 Temperature Regulating Valves

Provide ASSE 1017 copper alloy body with adjustable range thermostat.

2.1.6.5 Ball Valves

Flanged or butt-welding ends ball valve shall conform to MSS SP-72, bronze. Threaded, solder joint ends shall conform to MSS SP-110.

2.1.6.6 Flow Control Balancing Valves

Copper alloy or cast iron body, copper alloy or stainless internal working parts, and integral pointer that indicates the degree of valve opening. Valves shall be suitable for 125 psig at 190 degrees F hot water. Valve shall function as a service valve when in fully closed position. Valve body shall have factory-installed tapings for differential pressure meter connections for verification of pressure differential across valve orifice. Meter connections shall have positive check valves or shutoff valves. Each valve shall have metal tag showing the gallons per minute flow for each differential pressure reading.

2.1.6.7 Relief Valves

Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.1.6.8 Valve Operating Mechanisms

Provide power operators and extension stems where indicated and as specified.

- a. Power Operators: Shall be electric. Power operated valves shall open and close at rates no slower than 10 inches per minute for gate valves and 4 inches per minute for globe and angle valves. Valves shall open fully or close tightly without requiring further attention when the actuating control is moved to the open or close position. A predetermined thrust exerted on the stem during operation resulting from an obstruction in the valve shall cause the motor to automatically stop. Power operators shall be complete with all gearing and controls necessary for the size of valve being provided. Power operators shall be designed to operate on the electric power supply indicated.
- b. Extension Stem: Corrosion resisting steel designed for rising and non-rising stems. Provide in length required to connect the valve stem and the handwheel or operating mechanism and of sufficient cross section to transfer the torque required to operate the valve.

2.1.6.9 Balancing Valves

Balancing valves shall be calibrated bronze body balancing valves with integral ball valve and venturi or valve orifice and valve body pressure taps for flow measurement based on differential pressure readings. Valve pressure taps and meter connections shall have seals and built-in check valves with threaded connections for a portable meter. Meter shall be provided by the same manufacturer and be capable of reading system pressures and shall meet the requirements of the paragraph entitled "Flow Measuring Equipment." Valves shall have internal seals to prevent leakage around rotating element and be suitable for full shut-off rated pressure. Valves shall have an operator with integral pointer and memory stop. Balancing valves shall be selected for the required flows as indicated on the plans.

2.1.7 End Connections

2.1.7.1 Flexible Connectors

Provide flexible pipe connectors on piping connected to equipment. Flexible section shall consist of rubber, tetrafluoroethylene resin, corrosion-resistant steel, bronze, monel, or galvanized steel. Material provided and configuration shall be suitable for pressure, vacuum, temperature, and circulating medium. Flexible section shall have threaded, soldering, flanged or socket-weld ends and shall be suitable for service intended. Flexible section may be reinforced with metal retaining rings, with built-in braided wire reinforcement and restriction bolts or with wire braid cover suitable for service intended.

2.1.7.2 Steel Piping

Screwed or socket welded for 2 inches and smaller and flanged or butt

welded for 2 1/2 inches and larger.

- a. Screwed Joints With Taper Threads: ASME B1.20.1.
- b. Flanged Joints: Bolting and gaskets shall be as follows:
 - (1) Bolting: Bolt and stud material ASTM A 307, Grade B, and nut material ASTM A 194/A 194M, Grade 2. Bolt, stud, and nut dimensions ASME B18.2.2 threads ASME B1.1coarse type with Class 2A fit for bolts and studs, and Class 2B fit for nuts. Bolts or bolt studs shall extend completely through the nuts and may have reduced shanks of a diameter not less than the diameter at root of threads. Carbon steel bolts shall have American Standard regular square or heavy hexagon heads and shall have American Standard heavy semifinished hexagonal nuts conforming to ASME B18.2.2.
 - (2) Gaskets: ASME B16.21, Nonasbestos compressed material 1/16 inch thickness full face or self-centering flat ring type and suitable for pressure and temperature of the piping system.
- c. Butt Weld Joints: ASME B31.9. Backing rings shall conform to ASME B31.9. Ferrous rings shall not exceed 0.05 percent sulfur; for alloy pipe, backing rings shall be of material compatible with the chemical composition of the parts to be welded and preferably of the same composition. Provide continuous machined or split band backing rings.
- d. Socket Weld Joints: ASME B31.9.

2.1.7.3 Joints for Copper Tubing

- a. Solder conforming to ASTM B 32 alloy grade Sb5 or Sn96. Solder and flux shall be lead free (less than 0.2 percent of lead).
- b. Copper Tube Extracted Joint: An extracted mechanical tee joint may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to assure a free flow joint. Braze extracted joints using a copper phosphorous classification brazing filler metal. Soldered joints shall not be permitted.

2.1.8 Expansion Joints

2.1.8.1 Packless Type

Provide ASTM F 1120, Type III with fabricated corrosion-resistant steel bellows.

2.1.9 Instrumentation

2.1.9.1 Pressure and Vacuum Gauges

Provide ASME B40.1 with restrictor.

2.1.1.9.2 Indicating Thermometers

Thermometers shall be dial type with an adjustable angle suitable for the service. Provide thermowell sized for each thermometer in accordance with the thermowell specification. Fluid-filled thermometers (mercury is not acceptable) shall have a nominal scale diameter of 5 inches. Construction shall be stainless-steel case with molded glass cover, stainless-steel stem and bulb. Stem shall be straight, length as required to fit well. Bimetal thermometers shall have a scale diameter of 3 1/2 inches. Case shall be hermetic. Case and stem shall be constructed of stainless steel. Bimetal stem shall be straight and of a length as required to fit the well.

2.1.1.9.3 Pressure/Temperature Test Ports

Pressure/Temperature Test Ports shall have brass body and EPDM and/or Neoprene valve seals. Ports shall be rated for service between 35 and 275 degrees F and up to 500 psig. Ports shall be provided in lengths appropriate for the insulation thickness specified in Section 15080 MECHANICAL INSULATION and installed to allow a minimum of 12 inches of access for probe insertion. Provide with screw-on cap attached with a strap or chain to prevent loss when removed. Ports shall be 1/4 inch NPT and accept 1/8 inch diameter probes.

2.1.1.10 Miscellaneous Pipeline Components

2.1.1.10.1 Air Vent

Provide float type air vent in hydronic systems. Vent shall be constructed of brass or semi-steel body, copper float, and stainless steel valve and valve seat. ***Design air vent to suit system operating temperature and pressure. Pipe discharge of vent to a drain.***

2.1.1.10.2 Strainers

Strainers for classes 125 and 250 piping in IPS 1/2 to 8 inches, inclusive, FS WW-S-2739 and locate as indicated.

2.1.1.10.3 Hangers and Supports

Design and fabrication of pipe hangers, supports, and welding attachments shall conform to MSS SP-58 and ASME B31.9. Hanger types and supports for bare and covered pipe shall conform to MSS SP-69 for the temperature range.

2.1.1.10.4 Pipe Sleeves

Sleeves in masonry and concrete walls, floors, and roof slabs shall be ASTM A 53/A 53M, Schedule 40 or Standard Weight, hot-dip galvanized steel pipe. Sleeves in partitions shall be zinc-coated sheet steel having a nominal weight of not less than 0.906 pound per square foot.

2.1.1.10.5 Escutcheon Plates

Provide one piece or split hinge metal plates for piping passing through floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces and paint finish on metal plates in unfinished spaces.

2.2 PIPING SYSTEM EQUIPMENT

2.2.1 Pumps

Provide hot water circulating pumps, FS A-A-50560, Service A. Pump casing and flange shall be made of close-grained cast iron. Shaft shall be carbon or alloy steel with lubricated bearings and impeller shall be bronze. Select pumps so that the operating point on selected impeller-curve will lie at or to the left of shutoff side of, and not more than 5 percent below, point of maximum efficiency for impeller. Provide motors of splash proof type conforming to NEMA MG 1 and suitable for electrical characteristic as indicated. Motor starters shall conform to NEMA ICS 2 across the line type with NEMA ICS 6 general purpose enclosure.

2.2.2 Deleted

2.3 ELECTRICAL EQUIPMENT

Provide complete with motors, motor starters, thermal overload protection, and controls. Equipment and wiring shall be in accordance with Section 16402 INTERIOR DISTRIBUTION SYSTEM.

2.4 CONTROLS

Provide controls as specified in Section 15910 DIRECT DIGITAL CONTROL SYSTEMS.

2.5 INSULATION

Provide shop and field applied insulation as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL INSULATION.

2.6 ASBESTOS PROHIBITION

Asbestos and asbestos containing products are prohibited.

PART 3 EXECUTION

3.1 PREPARATION

Provide storage for equipment and material at the project site. All parts shall be readily accessible for inspection, repair, and renewal. Protect material and equipment from the weather.

3.2 INSTALLATION

Piping fabrication, assembly, welding, soldering, and brazing shall conform to ASME B31.9. Piping shall follow the general arrangement shown. Route piping and equipment within buildings out of the way of lighting fixtures and doors, windows, and other openings. Run overhead piping in buildings in inconspicuous positions. Provide adequate clearances from walls, ceilings, and floors to permit welding of joints and application of insulation. Make provision for expansion and contraction of pipe lines. Make changes in size of water lines with reducing fittings. Do not bury, conceal, or insulate until piping has been inspected, tested, and approved.

Do not run piping concealed in walls, partitions, except as otherwise indicated. Where pipe passes through building structure, locate pipe joints and expansion joints where they may be inspected. Provide flanged

joints where necessary for normal maintenance and where required to match valves and equipment. Furnish gaskets, packing, and thread compounds suitable for the service. Provide long radius ells where possible to reduce pressure drops. Pipe bends in lieu of welding fittings may be used where space permits. Pipe bends shall have a uniform radius of at least five times the pipe diameter and shall be free from appreciable flattening, wrinkling, or thinning of the pipe. Do not use mitering of pipe to form elbows, notching straight runs to form full sized tees, or any similar construction. Make branch connections over 2 inches with welding tees except factory made forged welding branch outlets or nozzles having integral reinforcements conforming to ASME B31.9 may be used, provided the nominal diameter of the branch is at least one pipe size less than the nominal diameter of the run. Branch connections 2 inches and under can be threaded or welded. Run vertical piping plumb and straight and parallel to walls. Provide sleeves for lines passing through building structure. Provide a fire seal where pipes pass through fire wall, fire partitions, and fire rated pipe chase walls. Install piping connected to equipment with flexibility for thermal stresses and for vibration, and support and anchor so that strain from weight and thermal movement of piping is not imposed on the equipment.

3.2.1 Hangers and Supports

Unless otherwise indicated, horizontal and vertical piping attachments shall conform to MSS SP-58. Band and secure insulation protection shields without damaging pipe insulation. Continuous inserts and expansion bolts may be used.

3.2.2 Grading of Pipe Lines

Unless otherwise indicated, install horizontal lines of hot water piping to grade down in the direction of flow with a pitch of not less than one inch in 30 feet, except in loop mains and main headers where the flow may be in either direction.

3.2.3 Pipe Sleeves

Provide sleeves where pipes and tubing pass through masonry or concrete roof and partitions. Annular space between pipe, tubing, or insulation and the sleeve shall not be less than 1/4 inch. Hold sleeves securely in proper position and location before and during construction. Sleeves shall be of sufficient length to pass through entire thickness of walls, partitions, or slabs. Firmly pack space between pipe or tubing and sleeve with oakum and caulk on both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. Seal both ends of penetrations through fire walls to maintain fire resistive integrity with UL listed fill, void, or cavity material.

3.2.4 Flashing for Buildings

Provide flashing where pipes pass through building roofs, and make outside walls tight and waterproof.

3.2.5 Unions and Flanges

Provide unions and flanges to permit easy disconnection of piping and apparatus. Each connection having a screwed-end valve shall have a union. Place unions and flanges no farther apart than 100 feet. Install unions

downstream of valves and at equipment or apparatus connections. Provide unions on piping under 2 inches in diameter, and provide flanges on piping 2 inches and over in diameter. Provide dielectric unions or flanges between ferrous and non-ferrous piping, equipment, and fittings; except that bronze valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or non-ferrous-to-non-ferrous connections.

3.2.6 Changes in Pipe Size

Provide reducing fittings for changes in pipe size; reducing bushings are not permitted. In horizontal lines, provide eccentric reducing fittings to maintain the top of the lines in the same plane.

3.2.7 Cleaning of Pipe

Thoroughly clean each section of pipe, fittings, and valves free of foreign matter before erection. Prior to erection, hold each piece of pipe in an inclined position and tap along its full length to loosen sand, mill scale and other foreign matter. For pipe 2 inches and larger, draw wire brush, of a diameter larger than that of the inside of the pipe, several times through the entire length of pipe. Before making final connections to apparatus, wash out interior of piping thoroughly with water. Plug or cap open ends of mains during shutdown periods. Do not leave lines open where foreign matter might enter the pipe.

3.2.8 Valves

Install valves in conformance with ASME B31.9. Provide gate valves unless otherwise directed. Install valves with stems horizontal or above. Locate or equip stop valves to permit operation from floor level, or provide with safe access in the form of walkways or ladders. Install valves in positions accessible for operation and repair.

3.2.8.1 Globe Valves

Install globe valves so that the pressure is below the disk and the stem horizontal.

3.2.8.2 Relief Valves

Provide valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks. Select system relief valve so that capacity is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Pipe relief valve outlet to the nearest floor drain.

3.2.9 Pressure Gage

Provide a shut-off valve or pet cock between pressure gages and the line.

3.2.10 Thermometers

Provide thermometers and thermal sensing elements of control valves with a separable socket. Install separable sockets in pipe lines in such a manner to sense the temperature of flowing the fluid and minimize obstruction to flow.

3.2.11 Strainers

Provide strainers, with meshes suitable for the services, where indicated, or where dirt might interfere with the proper operation of valve parts, orifices, or moving parts of equipment.

3.2.12 Pumps

Select pumps for specified fluid temperatures, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve. Support piping adjacent to pump such that no weight is carried on pump casings. Install close coupled and base mounted pumps on concrete base, with anchor bolts, set and level, and grout in place and provide supports under elbows on pump suction and discharge line sizes 4 inches and over. Lubricate pump before start-up.

3.2.13 Equipment Foundations

Locate equipment foundations as shown on the drawings. Size, weight, and design shall preclude shifting of equipment under operating conditions. Foundations shall meet the requirements of the equipment manufacturer. Concrete shall conform to Section 03307 CONCRETE FOR MINOR STRUCTURES, and grout shall be approved non-shrinking.

3.2.14 Equipment Installation

Install equipment in accordance with installation instructions of the manufacturers. Grout equipment mounted on concrete foundations before installing piping. Install piping in such a manner as not to place a strain on the equipment. Do not bolt flanged joints tight unless they match. Grade, anchor, guide, and support piping without low pockets.

3.2.15 Cleaning of Systems

As installation of the various system components is completed, fill, start, and vent prior to cleaning. Place terminal control valves in open position. Add cleaner to closed system at concentration as recommended by manufacturer. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water and repeat until system cleaner is removed.

Use neutralizer agents on recommendation of system cleaner supplier and approval of Contracting Officer. Remove, clean, and replace strainer screens. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required. Preliminary or final tests are not permitted until cleaning is approved.

3.2.16 Painting of Piping and Equipment

Provide in accordance with Section 09900 PAINTS AND COATINGS.

3.2.17 Identification of Piping

Identify piping in accordance with OSHA 29 CFR 1910.144, except that labels or tapes may be used in lieu of painting or stencilling. Spacing of identification marking on runs shall not exceed 50 feet. Materials for labels and tapes shall conform to FS A-A-1689, and shall be general purpose

type and color class. Painting and stencilling shall conform to Section 09900 PAINTS AND COATINGS.

3.3 FIELD QUALITY CONTROL

Perform inspections and tests as specified herein to demonstrate that piping and equipment, as installed, is in compliance with contract requirements. Start up and operate the system. During this time, periodically clean the various strainers until no further accumulation of foreign material occurs. Exercise care so that minimum loss of water occurs when strainers are cleaned. Adjust safety and automatic control instruments to place them in proper operation and sequence.

3.3.1 Hydrostatic Test of Piping System

Test piping system hydrostatically using water not exceeding 100 degrees F. Conduct tests in accordance with the requirements of ASME B31.9 and as follows. Test piping system after all lines have been cleaned and before applying insulation covering. Remove or valve off from the system, gages, and other apparatus which may be damaged by the test before the tests are made. Install calibrated test pressure gage in the system to observe any loss in pressure. Maintain test pressure for a sufficient length of time to enable an inspection of each joint and connection. Perform tests after installation and prior to acceptance. Notify the Contracting Officer in writing 7 days prior to the time scheduled for the tests.

3.3.2 Auxiliary Equipment and Accessory Tests

Observe and check pumps, accessories, and equipment during operational and capacity tests for leakage, malfunctions, defects, noncompliance with referenced standards, or overloading.

3.3.2.1 Backflow Preventers

Backflow preventers shall be tested by locally approved and certified backflow assembly testers. A copy of the test report shall be provided to the Contracting Officer prior to placing the domestic water system into operation, or no later than 5 days after the test.

3.4 TESTING, ADJUSTING, AND BALANCING

Test, adjust, and balance the hydronic system in accordance with Section 159 90 HVAC TESTING/ADJUSTING/BALANCING.

3.4.1 Markings of Settings

Following final acceptance of the balancing report, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked so that adjustment can be restored if disturbed at anytime.

-- End of Section --

SECTION 15990

TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1 (2002) National Standards for Total System Balance

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB TABES (1998) Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA HVACTAB (2002, 3rd Ed) HVAC Systems - Testing, Adjusting and Balancing

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

TAB Schematic Drawings and Report Forms; G,DO

Three copies of the TAB Schematic Drawings and Report Forms, no later than 21 days prior to the start of TAB field measurements.

SD-03 Product Data

TAB Related HVAC Submittals

A list of the TAB Related HVAC Submittals, no later than 7 days after the approval of the TAB Specialist.

TAB Procedures; G,DO

Proposed procedures for TAB, submitted with the TAB Schematic Drawings and Report Forms.

Calibration

List of each instrument to be used during TAB, stating calibration requirements required or recommended by both the TAB Standard and the instrument manufacturer and the actual calibration history of the instrument, submitted with the TAB Procedures. The calibration history shall include dates calibrated, the qualifications of the calibration laboratory, and the calibration procedures used.

Deleted

TAB Execution; G,DO

Proposed date and time to begin field measurements, making adjustments, etc., for the TAB Report, submitted with the Systems Readiness Check Report.

TAB Verification; G,DO

Proposed date and time to begin the TAB Verification, submitted with the TAB Report.

SD-06 Test Reports

Design Review Report; G,DO

A copy of the Design Review Report, no later than 14 days after approval of the TAB Firm and the TAB Specialist.

Deleted

TAB Report; G,DO

Three copies of the completed TAB Reports, no later than 7 days after the execution of TAB. All items in the TAB Report shall be signed by the TAB Specialist and shall bear the seal of the Professional Society or National Association used as the TAB Standard.

Deleted

SD-07 Certificates

Deleted

TAB Firm; G,DO

Certification of the proposed TAB Firm's qualifications by either AABC, NEBB, or TABB to perform the duties specified herein and in other related Sections, no later than 21 days after the Notice to Proceed. The documentation shall include the date that the Certification was initially granted and the date that the current Certification expires. Any lapses in Certification of the proposed TAB Firm or disciplinary action taken by AABC, NEBB or TABB against the proposed TAB Firm shall be described in detail.

TAB Specialist; G,DO

Certification of the proposed TAB Specialist's qualifications by either AABC, NEBB, or TABB to perform the duties specified herein and in other related Sections, no later than 21 days after the Notice to Proceed. The documentation shall include the date that the Certification was initially granted and the date that the current Certification expires. Any lapses in Certification of the proposed TAB Specialist or disciplinary action taken by AABC, NEBB, or TABB against the proposed TAB Specialist shall be described in detail.

1.3 SIMILAR TERMS

In some instances, terminology differs between the Contract and the TAB Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed herein to produce optimal results. The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding AABC, NEBB, or TABB requirements where differences exist.

SIMILAR TERMS

Contract Term	AABC Term	NEBB Term	TABB Term
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.	SMACNA's Procedures
TAB Specialist	TAB Engineer	TAB Supervisor	TAB Supervisor
Systems Readiness Check	Construction Phase Inspection	Field Readiness Check & Preliminary Field Procedures.	Field Readiness Check & Prelim. Field Procedures

1.4 TAB STANDARD

TAB shall be performed in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. The provisions of the TAB Standard, including checklists, report forms, etc., shall, as nearly as practical, be used to satisfy the Contract requirements. The TAB Standard shall be used for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, the manufacturer's recommendations shall be adhered to. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, TAB procedures shall be developed by the TAB Specialist. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by

the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements shall be considered mandatory.

1.5 QUALIFICATIONS

1.5.1 TAB Firm

The TAB Firm shall be either a member of AABC or certified by the NEBB or the TABB and certified in all categories and functions where measurements or performance are specified on the plans and specifications, including TAB of environmental systems, building systems commissioning and the measuring of sound and vibration in environmental systems. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the firm loses subject certification during this period, the Contractor shall immediately notify the Contracting Officer and submit another TAB Firm for approval. Any firm that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections to be performed by the TAB Firm shall be considered invalid if the TAB Firm loses its certification prior to Contract completion and must be performed by an approved successor. These TAB services are to assist the prime Contractor in performing the quality oversight for which it is responsible. The TAB Firm shall be a subcontractor of the prime Contractor and shall be financially and corporately independent of the mechanical subcontractor, and shall report to and be paid by the prime Contractor.

1.5.2 TAB Specialist

The TAB Specialist shall be either a member of AABC, an experienced technician of the Firm certified by the NEBB, or a Supervisor certified by the TABB. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, the Contractor shall immediately notify the Contracting Officer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC, the NEBB, or the TABB within the five years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the TAB Specialist shall be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by the approved successor.

1.6 TAB SPECIALIST RESPONSIBILITIES

All TAB work specified herein and in related sections shall be performed under the direct guidance of the TAB Specialist. The TAB specialist is required to be onsite on a daily basis to direct TAB efforts. The TAB Specialist shall participate in the commissioning process specified in Section 15995 COMMISSIONING OF HVAC SYSTEMS.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 DESIGN REVIEW

The TAB Specialist shall review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the effective and accurate TAB of the system. The TAB Specialist shall provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

3.2 TAB RELATED HVAC SUBMITTALS

The TAB Specialist shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful accomplishment of all HVAC TAB. The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the TAB Specialist when submitted to the Government. The TAB Specialist shall also ensure that the location and details of ports, terminals, connections, etc., necessary to perform TAB are identified on the submittals.

3.3 TAB SCHEMATIC DRAWINGS AND REPORT FORMS

A schematic drawing showing each system component, including balancing devices, shall be provided for each system. Each drawing shall be accompanied by a copy of all report forms required by the TAB Standard used for that system. Where applicable, the acceptable range of operation or appropriate setting for each component shall be included on the forms or as an attachment to the forms. The schematic drawings shall identify all testing points and cross reference these points to the report forms and procedures.

3.4 **DELETED**

3.5 TESTING, ADJUSTING, AND BALANCING

3.5.1 TAB Procedures

Step by step procedures for each measurement required during TAB Execution shall be provided. The procedures shall be oriented such that there is a separate section for each system. The procedures shall include measures to ensure that each system performs as specified in all operating modes, interactions with other components (such as exhaust fans, fume hoods, relief vents, etc.) and systems, and with all seasonal operating differences, diversity, simulated loads, and pressure relationships required.

3.5.2 **Deleted**

3.5.3 Preparation of TAB Report

Preparation of the TAB Report shall begin only when the Systems Readiness Report has been approved. The Report shall be oriented so that there is a separate section for each system. The Report shall include a copy of the appropriate approved Schematic Drawings and TAB Related Submittals, such as pump curves, fan curves, etc., along with the completed report forms for each system. The operating points measured during successful TAB Execution

and the theoretical operating points listed in the approved submittals shall be marked on the performance curves and tables. Where possible, adjustments shall be made using an "industry standard" technique which would result in the greatest energy savings, such as adjusting the speed of a fan instead of throttling the flow. Any deficiencies outside of the realm of normal adjustments and balancing during TAB Execution shall be noted along with a description of corrective action performed to bring the measurement into the specified range. If, for any reason, the TAB Specialist determines during TAB Execution that any Contract requirement cannot be met, the TAB Specialist shall immediately provide a written description of the deficiency and the corresponding proposed corrective action necessary for proper system operation to the Contracting Officer.

3.5.4 ***Deleted***

3.5.5 Marking of Setting

Following approval of TAB Verification Report, the setting of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time.

3.5.6 Identification of Test Ports

The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leakage or to maintain integrity of vapor barrier.

-- End of Section --

1.3.4 Telecommunications Room (TR)

An enclosed space for housing telecommunications equipment, cable, terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and the horizontal cabling.

1.3.5 Entrance Facility (EF) (Telecommunications)

An entrance to the building for both private and public network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.

1.3.6 Entrance Room (ER) (Telecommunications)

A centralized space for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

1.3.7 Open Cable

Cabling that is not run in a raceway as defined by NFPA 70. This refers to cabling that is "open" to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space.

1.3.8 Open Office

A floor space division provided by furniture, moveable partitions, or other means instead of by building walls.

1.3.9 Pathway

A physical infrastructure utilized for the placement and routing of telecommunications cable.

1.4 SYSTEM DESCRIPTION

The building telecommunications cabling and pathway system shall include permanently installed backbone and horizontal cabling, horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for splicing, terminating, and interconnecting cabling necessary to transport telephone and data (including LAN) between equipment items in a building. The horizontal system shall be wired in a star topology from the telecommunications work area to the floor distributor or campus distributor at the center or hub of the star. The backbone cabling and pathway system includes intrabuilding and interbuilding interconnecting cabling, pathway, and terminal hardware. The intrabuilding backbone provides connectivity from the floor distributors to the building distributors or to the campus distributor and from the building distributors to the campus distributor as required.. The backbone system shall be wired in a star topology with the campus distributor at the center or hub of the star. Provide telecommunications pathway systems referenced herein as specified in Section 16402 INTERIOR DISTRIBUTION SYSTEM. The telecommunications contractor must coordinate with the NMCI contractor concerning access to and configuration of telecommunications spaces. The telecommunications contractor may be required to coordinate work effort within the telecommunications spaces with the NMCI contractor. ***The final connection of the telecommunications system will be done by the Government.***

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Telecommunications cabling (backbone and horizontal); G, DO

Telecommunications outlet/connector assemblies; G, DO

Submittals shall include the manufacturer's name, trade name, place of manufacture, and catalog model or number. Include performance and characteristic curves. Submittals shall also include applicable federal, military, industry, and technical society publication references. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified in paragraph REGULATORY REQUIREMENTS and as required in Section 01330 SUBMITTAL PROCEDURES.

SD-06 Test Reports

Telecommunications cabling testing; G, DO

SD-07 Certificates

Telecommunications Contractor Qualifications; G, DO

Key Personnel Qualifications; G, DO

1.6 QUALITY ASSURANCE

1.6.1 Shop Drawings

In exception to Section 01330, SUBMITTAL PROCEDURES, submit shop drawings a minimum of 14 by 20 inches in size using a minimum scale of 1/8 inch per foot. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. Submittals shall include the nameplate data, size, and capacity. Submittals shall also include applicable federal, military, industry, and technical society publication references.

1.6.1.1 Telecommunications Drawings

Provide drawings in accordance with EIA TIA/EIA-606-A. The identifier for each termination and cable shall appear on the drawings. Drawings shall depict final telecommunications installed wiring system infrastructure in accordance with EIA TIA/EIA-606-A. The following drawings shall be

3.5.1.3 ***Deleted***

-- End of Section --

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